Report of Proceedings

FOURTH CONFERENCE ON MAPLE PRODUCTS

October 27 and 28, 1959

Conference was held at the Eastern Utilization Research and Development Division with representatives of industry and government from the United States and Canada participating. The State Agricultural Experiment Stations, the Extension Service, universities, maple producers, processors and distributors, equipment manufacturers, state governments, and the U. S. Department of Agriculture were represented.

This report summarizes the discussions of the various speakers during the conference. If further details regarding any particular subject are desired, they may be obtained by communicating with the person concerned (see appended list of names and addresses).

Eastern Utilization Research and Development Division
Agricultural Research Service
U. S. Department of Agriculture
Philadelphia 18, Pennsylvania

PROGRAM

Tuesday, October 27

8:30 a.m.	Registration	
9:30 a.m.	Welcome	P. A. Wells, Director Eastern Utilization Research and Development Division
9:45 a.m.	Wisconsin's Promotional Program for Maple Products	T. A. Peterson Extension Forester University of Wisconsin Madison, Wisconsin
10:30 a.m.	How I Sell Maple Sirup	R. I. Spade Maple Sales Ferrisburg, Vermont
11:15 a.m.	The Future of Blended Maple Sirups	F. A. Baxter Products Manager General Foods Corporation White Plains, New York
12:00 Noon	A National Maple Industry Council	M. Thibaudeau Member, Wisconsin Maple Producers Council Luxemburg, Wisconsin
12:30 p.m.	LUNCH	
2:00 p.m.	The Maple Industry in the Province of Quebec	J. Tardif, Chief Division of Chemistry Department of Agriculture Quebec, Canada
2:45 p.m.	New Developments in the New York Maple Industry	F. E. Winch, Jr. Extension Forester Cornell University Ithaca, New York
3:30 p.m.	Maple Sap Flow through Plastic Tubing	R. R. Morrow, Jr. Research Forester Cornell University Ithaca, New York
4:15 p.m.	A Cost Account of Plastic Tubing vs. Buckets for Sap Collection	L. Sipple Maple Producer Bainbridge, New York

Wednesday, October 28

9:00 a.m.	The Mechanism of Sap Flow	J. W. Marvin, Head Department of Botany University of Vermont Burlington, Vermont
9:45 a.m.	Propagation of Maple Trees with High Quality Sap Characteristics	A. Gilbert, Leader Burlington Project U. S. Forest Service Burlington, Vermont
10:30 a.m.	Chemistry of Color and Flavor of Maple Products. A Progress Report	C. O. Willits, Head Maple Investigations Eastern Utilization Research and Development Division
11:15 a.m.	Use of Pure Maple by the Ice Cream Industry	W. K. Jordan, Professor Department of Dairy Industry Cornell University Ithaca, New York
12:30 p.m.	LUNCH	
2:00 p.m.	Improving Quality and Quantity of Maple Sap	P. W. Robbins, Professor Department of Forestry Michigan State University East Lansing, Michigan
2:45 p.m.	EURDD EXHIBITS AND DEMONSTRATIONS	

Ion Exchange Methods of Separating Color and Flavor, Their Fractionation and Purification.

Quick Test for Microbial Counts In Sap.

A New Gas Operated Rapid Evaporator.

Closed Hood Steam Venting System.

INTRODUCTORY REMARKS

by
P. A. Wells
Eastern Utilization Research and Development Division

Dr. Wells welcomed the conferees to the meeting and asked each to rise and identify himself. He pointed out that the present conference represented the 4th on Maple held here since Maple Work began about 12 years ago. The past 3 were outstanding in the quality of the papers presented, and the interest and enthusiasm of those attending. He felt sure that the present conference would be equally successful. A conference report consisting of summaries of the papers presented will be made and each conferee will receive a copy. Extra copies can be obtained on request.

WISCONSIN'S PROMOTIONAL PROGRAM FOR MAPLE PRODUCTS

by
T. A. Peterson, University of Wisconsin
Madison, Wisconsin

A. Wisconsin Maple Resource Potential

There are more cows than people in our state of Wisconsin! Agricultural Census reports verify our state slogan - "America's Dairyland." It is also true that there are a great many more maple trees in the state than people and herein lies my story and Wisconsin's challenge in developing an important native forest crop - a product not plagued with parity prices and crop surplus problems.

(1) Acreage of Maple

Of the 36 million land acres in the state, some 16 million are classified as commercial forest land. Analyzing the state acreage and volume figures, I computed a potential of at least 344,000 acres of sugar maple sawtimber of tappable size in Wisconsin.

Calculating the potential resource another way, the "forest inventory" figures show the total number of sound tappable sugar maples in Wisconsin (12" and over in diameter) to be 15,613,000, with an average of 45 trees per acre.

A maple production study conducted in Wisconsin in 1953 showed an average of 23 trees tapped per acre. Recent State Crop Census reports indicate from 300,000 to 400,000 trees tapped per year. Converting these data to acreage, about 17,000 acres are being tapped at present.

This indicates that only 5% of the potential sugar maple acreage is now being utilized in the state. Basing the percentage figure on potential tappable trees and trees actually tapped, we are utilizing only 2% of the resource for maple. I would like to emphasize that this is a tremendously important potential resource Wisconsin has just barely "tapped."

It should also be pointed out that 70% of the total commercial forest land is privately-owned. Likewise a large proportion of the tappable maples is privately-owned and specifically farm-owned. The maple crop can represent an important supplement to the annual earnings of low-net income farmers and other workers, especially in our northern Wisconsin counties. Sap is collected and processed during a short period in the spring when other work is slack. We in Agricultural Extension feel that the promotion of the maple crop, especially in these critical areas, constitutes a partial solution to these people for a higher standard of living.

B. Recent Wisconsin Maple Production

What is the present status of Wisconsin maple production? Generally speaking, some 350,000 trees are tapped annually by about 2500 farmers who process approximately 75,000 gallons of maple sirup.

Four counties in north central Wisconsin alone account for 1/3 of the producers, 1/3 of the trees tapped, and 1/2 of the sirup production. The potential field for expansion includes the greater share of the state with the exception of the old glacial Lake Wisconsin sandy bed in central Wisconsin, and the oak-prairie areas in southern Wisconsin.

A large share of smaller sirup producers sell their crop to local people and to summer tourists. A few of the larger processors export a portion of their crop to other states. The potential for expansion in state-wide production of maple products is here. The need for developing this resource is also evident. These circumstances, however, pose the problem of expanding local markets as well as developing out-of-state markets. I would like to review briefly our promotional efforts being developed in this regard.

C. Promotion of Wisconsin Maple Products

(1) Institutes and Newsletter

Promotion of any commercial product must begin with the producer and processor. In the advertising field, it is axiomatic that a good salesman must develop confidence in his product and be "sold" on it himself, before he can sell it to others. This is certainly true in this day, when maple sirup and sugar are not the staple household items for cooking and canning they once were, but rather are a luxury item with exceptional characteristics. Confidence is readily established with a high quality product.

For the past nine years the Extension Forestry Office has promoted a series of nine or ten annual winter maple producer institutes in the principal

centers of production. These all-day meetings are devoted to discussions of the various aspects of quality production, review of new research findings from the Philadelphia Laboratory, and to consideration of production and marketing problems pointed up by producers themselves. Each year about 500 producers attend these institutes to pick-up new ideas, to keep abreast of the industry, and to prepare for the coming season.

Because of unpredictable weather the winter schedule has not always made it easy for those of us driving the two-week circuit. However, this timing has the following points in its favor: (1) It is during a period of slack work and many farmer-producers can attend the meetings during the winter season; (2) Preparations can be made in advance of the tapping season.

One very important aspect of the institutes which contributes very materially to the success of our meetings is the very close cooperation we have received from the equipment dealers in our state who set up exhibits and equipment, and take an active part on our programs.

We are also appreciative of the assistance given by county Extension staffs, Conservation Department foresters, the Marketing Division of the Wisconsin Department of Agriculture, the Philadelphia Laboratory staff, and other agencies.

I believe we are justified in stating that the institutes have generated real producer interest to the point where a considerable number have modernized their maple operations, with efficiency and quality in mind.

Approximately 1500 producers who have attended the institutes were placed on our mailing list to receive the Wisconsin Maple Producers Newsletter which is issued periodically during the year. This Newsletter carries items of interest to producers, and also announces meeting and institute schedules.

(2) Wisconsin Maple Producers Council

In 1957 a Maple Producers Council was established to promote the distribution and sale of Wisconsin maple products. This is a voluntary group invited by representatives of the Wisconsin Department of Agriculture and the University College of Agriculture to serve as representatives of the industry in setting up a wide advertising program. The ten members represent the various producing regions of the state.

Included in the Council membership is the Chief of the Division of Markets, Wisconsin Department of Agriculture. There are limited funds and services available through the Marketing Division for promoting the use of agricultural products, including maple.

The Maple Producers Council began with no funds on hand (just a bit of faith) and proposed to finance the promotional project through income from advertisements in a trade journal devoted exclusively to Wisconsin's maple industry. Advertisements were solicited from manufacturers of processing equipment and from producers having maple products for sale. Aside from

the trade journal, the Council also has promoted the use and sale of maple products through a "maple pool," cooperating in the annual spring maple festival, in fair exhibits, and in advertisements. Mention will be made of some of these efforts separately.

(3) Wisconsin Maple Producers Annual

The first edition of the trade journal was issued during the summer of 1957. The Maple Producers Annual marks a sustained effort on the part of producers, working through a voluntary Council, to stimulate interest in processing a uniformly good product, and to inform potential users of sources of a highly desirable sweet. Each issue of the Annual has received wide distribution within the state as well as out-of-state. Every producer on the mailing list receives a copy. Prospective consumers receive copies at our fairs. Local as well as out-of-state distribution has been made through the State Department of Agriculture mailing lists and through distribution at national conventions. Some 500 copies are sent to a select list of dieticians and purchasing agents for hotels, hospitals, food stores, and restaurants.

(4) Maple Pool

In addition to publishing the second edition of the trade journal in 1958, the Council sponsored a "maple pool" for the purpose of providing a source of bottled maple samples advertising Wisconsin sirup in the form of favors at conventions held in the state. The idea here is to give potential consumers a tantalizing taste of good maple and to create an active desire to get more for family-use.

Producers contribute either sirup or money to the pool. The direct financial assistance is used to cover the cost of the 2-1/2 oz. samples. The sticker attached to each bottle identifies the product as from Wisconsin and indicates how more of the sirup can be obtained.

In establishing this maple pool, it was realized that a limit would have to be set on the amount of sirup given away. With the present limited resources of the Council, it was agreed to follow the established State Department of Agriculture policy of limiting free samples to 250 for any one convention. Additional favors are offered to convention officials at actual cost. Preference is given to convention groups whose interests center around nutrition, forestry and conservation.

The cooperation of producers around the state has been very gratifying and the sample favors have been enthusiastically received at conventions. In continuing this program we hope to promote wider consciousness of a good pure product, which will generate larger use and sale for our entire state industry.

(5) Revised Wisconsin State Grades

Five years ago attention was called to the fact that official Wisconsin maple sirup grades established in the 1930's had been recognized by the Department of Agriculture, but virtually no sirup was being sold with

a grade label. Under those grade specifications, Wisconsin Fancy sirup - the top grade - had such high requirements in reference to color (no darker than extra light amber) that extremely little sirup in the state could be so labelled.

It was recognized that failure to promote a practical system of grade labelling resulted in too much dark sirup of an industrial grade going into small containers for table use. This kind of sirup is bad advertising for Wisconsin maple products.

As a corrective step for this situation, new revised grades were proposed and discussed at the 1955 maple institutes. Official hearings were held by the Department of Agriculture, and the revised grades were approved by the producers. The current official state grades lower the color in the top grades, and designate a specific grade for sirup which is substandard for table use. Briefly, Wisconsin Fancy is lighter than medium amber, Wisconsin Grade A is from dark amber through medium amber, and Wisconsin Manufacturer's Grade (not recommended for table use) is darker than dark amber. A characteristic flavor, clarity, and freedom from sediments are also embodied in the grades. These grades take on meaning, however, only as they are generally used by producers and recognized by consumers. Since grade labelling is voluntary in Wisconsin, promotional efforts will be directed toward producer and consumer to sell and buy sirup on this basis.

(6) Spring Maple Festival - Aniwa

For many years, one of our producers, Mr. Adin Reynolds, has held a popular Maple Festival each spring at his plant near Aniwa. This started out as a small, local "open house" but has continued to grow year by year. In recent years he has been host to some 3,000 to 4,000 guests at the festival. Bus-loads of people travel many miles to attend this event, learn how maple products are made, and actually eat their fill for the day. As hosts, the Reynolds put on a traditional pancake-maple sirup-sausage feed.

Since 1956, the maple producers as well as consumers have been involved in the Maple Festival through a sirup judging contest. This keen competition creates a quality-conscious producer, and the end result will be satisfied customers. A panel of impartial judges selects the top quality sirup entered, and the Council makes the awards. The spring Maple Festival has been an excellent way to promote the maple industry in Wisconsin. We are looking forward to expanding this type of event to other maple producing areas in the state.

(7) Restaurant Trade

This year our Council, in cooperation with the Department of Agriculture, keyed its trade promotion advertising to restaurant and hotel groups which serve a large percentage of Wisconsin's tourist group. It is a simple and direct approach and offers our guests an option to order pure maple sirup at meals, and make the necessary extra charge. Practically nowhere are patrons at hotels and restaurants given such an option,

although it is customary to offer an option on breakfast menus between milk and cream for cereals.

The Council purchased a half-page ad in the May issue of the Wisconsin Restaurateur, the restaurant and hotel trade journal. Appearing along with this aid was a feature story on the Wisconsin maple industry. A large supply of menu "slip ons" was printed by the Council and made available to the hotel and restaurant trade. These menu notes call attention to the option of pure maple on an order of cakes or waffles.

(8) Recipe Folder

Each year the Nutritionist on the staff of the Markets Division prepares a new recipe folder which high-lights different foods prepared with maple. Some 3,000 are printed and distributed each year, two-thirds go to a special U. S. mailing list. These have also been utilized by producers, and made available at the State Fairs.

(9) Mass Media

Mass media, such as TV, radio, newspaper, and magazine, have also been utilized extensively in our promotion of the maple industry. The College of Agriculture, in cooperation with the Extension Forestry Office, has prepared a 12-minute TV film explaining the maple sirup story. This has been widely used on stations and for group showings. Plans are underway to produce a color movie on the subject, which we believe will be even more popular.

Many producers have appeared on local TV and radio programs to acquaint the public with this industry and its products. This type of direct promotion, along with newspaper and magazine articles, I am sure is nothing new to any of you.

D. Conclusion

Effective promotional programs for any industry depend upon a conscious repetition and variety of advertisement. I think the following paraphrased story will amplify my point: "The Man by the Side of the Road."

* * * * * *

There was a man who lived by the side of the road and sold maple sirup. He was hard of hearing, so he had no radio. He had trouble with his eyes, so he seldom read newspapers. But he produced and sold good maple sirup. He was a firm believer in advertising, so he put up signs along the highway advertising the merits of his maple, and he stood by the side of the road and cried out, "Buy some good maple sirup, mister?" And people bought.

He increased his bush operation by buying more buckets, bags, and tubing, and traded for a bigger evaporator to take care of his trade. He increased his glass and tin orders. Finally business became so good that he brought

his son home from the city to help him. Then something happened -- his son said to him one day: "Dad, haven't you been listening to the radio or reading the papers these days? We're in pretty serious times. The European and Asian situation seems to be getting worse. Our own domestic picture looks pretty dark, with the steel strike and all. Everything seems to be goin to pot."

Whereupon the father thought -- "Well, my son has been to college. He has lived in the big city with big businessmen. He reads the newspaper and listens to the radio. He ought to know what's going on." So the father cut down on his sugar bush operation, curtailed his advertising and no longer bothered to stand by the highway and call out his wares. And you know, his sales fell off almost overnight!

He said to his boy -- "You were right, son, we certainly are in the middle of a big depression."

* * * * * * * *

An expanding industry requires an aggressive promotional program. We have tried to reach both our producers and consumers in the Wisconsin program. We're reasonably proud of the accomplishments to date - however, we recognize the many problems and needs ahead which will require the combined support of the industry. Our producers are appreciative of the suggestions and ideas which have been offered by many of you. If there have been any promotional ideas presented here which might be of value to you - we are more than happy to share them.

HOW I SELL MAPLE SIRUP

by

Ralph I. Spade, Ferrisburg, Vermont

I sell maple products from a roadside stand on my farm near Ferrisburg, Vermont. To me the operation of a roadside stand is quite comparable to fishing and I would like to tell you about the similarities. They are as follows:

1. Desire - One does not go fishing unless there is a desire to do so. It is the same for running a roadside stand. If you don't like selling and meeting people don't do it. You won't make a success of it.

2. Where to Fish - In picking your fishing spot choose the most likely place for fish to be. Likewise one cannot sell maple sirup without people to sell to. It is well to survey various possible locations for your stand for customer potential. You may help stock your pond of maple customers by supporting development commissions, festivals, and other events that bring people to your area. Another important point to consider in determining the location of your stand is the means available to get to it. Your customers will come and gofrom your area on roads. But the type road is important

and can be compared to a fishing stream. If the stream is dry - no fish. If the river is at flood stage - no fish. A well-traveled road is essential, but it should be one carrying tourists not an expressway between two large cities. Also the stand should not be more than 200 yards off the road. Most people do not get far off a route planned for them on a map. Also the entrance to the stand should be so constructed that the customer can get off the highway easily - even at 60 miles an hour. At home we have a black top runway for "landings and take-offs."

3. Tackle and Lures - Now that you have found a place you think is well-stocked with fish, it will take tackle and lures to catch them. First, you will need signs on the highway advertising your product. These should be simple and easily read at 60 miles an hour. It is far more important to talk about what you are selling than who is selling it. Opinions differ as to the distance from the stand that road signs should be erected. This will depend on the size of your operation -- the bigger your business the further away you can advertise. I prefer "spot" signs no more than 1-2 miles from the stand. Most important point is to keep the signs clean, bright and in good repair. Also, to lure the customer to your display of products, an attractive stand and surroundings are needed. They should be designed to attract the type of fish you want to catch. In the case of maple sirup, this is peiple with money because maple products are definitely "luxury items" that most folks can do without.

4. Live Bait - When your tackle and lures have attracted a customer, whether a sale is made will depend largely on the bait offered him. Our bait, of course, is the products on display. There should be as large a variety of them as possible as the fish we are trying to catch have liking for a great number of different baits. At our stand we have sirup packed in containers of 39 different shapes, colors, and sizes. The largest volume of sales is the medium sized containers (pint and quart). Among the containers are 3 colors of cans in a range of sizes, oblong bottles of 7 sizes, glass cruets, six-ounce cans, and pottery jugs. The pottery jugs have not proved to be good containers as some customers have reported off-flavors in the sirup from them. Also, a variety of maple products such as butternut fudge, cream, sugar cakes, soft sugar etc., should be on hand. Above all, these products should be high quality and neatly packaged. Rusty cans, dirty bottles, and cloudy sirup won't attract customers.

5. "Got a Bite" - When a car stops in front of your stand, you have a "bite." However, it may not be a real hearty bite. Some fish like to "bump the bait" to test it before really getting serious. If people stop and do not get out of their cars, but open their windows, lean out, and ask "How much is sirup?", they are not customers yet. Something must be done to get them into the stand. Don't give them the price of a gallon of sirup, but mention a low figure without designating the amount of sirup of which it is the price. Invite them to come in and then walk away. If this doesn't interest them, they probably would not have bought anything anyway.

6. Skill of the Fisherman - When a customer has taken a "bite" of your bait, the amount of the sale you make depends on your salesmanship.

First, if you can get the customer inside the stand you have a better chance of selling something extra. Present the product in which the buyer is primarily interested, get a sale, and then suggest other items. Learn to know when a person is sold and don't oversell. Then arouse interest in other items by explaining how they are made, how to use them, and how they are different, especially in taste. Samples are excellent if handled so as to prevent messiness. The reason for getting a sale on an item before the customer has time to see all your wares is that most people will not turn back items already bought. Rather, an additional sale will be made if another desired item is found.

7. Repeat Business - When you have made an interested and satisfied customer out of a curious one, then you have a repeat buyer on the string. There are many things you can do to bring this about. Above all have good products and give full measure. Further, be friendly, tell the truth about your products. Finally, thank people for stopping even though they don't buy and have a small reminder of your business to give away. A picture post card, a price list, or name card are all good. Another point that brings people back is to keep your stand open and have it properly attended during the times it should be open. When you close for the season take down your signs or indicate on them that you are closed and when you will reopen the following season.

8. Related Products - We have found that farm products such as cheese, honey, apples and other fruit, pumpkins and squash, and summer vegetables sell in conjunction with a maple stand. Also souvenirs and gifts are profitable items. Many people if they get stopped to buy one thing will make several purchases if a variety of merchandise is available.

9. Tricks of the Trade - There are many gimmicks used in the selling game, but the best trick of the trade is to buy sirups at a price at which you can stay competitive and at a price at which you can sell sirup in volume at a profit. Of course this is what everyone is trying to do. In closing, I might mention a few "tricks" that help sales. The use of decoy cans to convey the idea of a popular, thriving stand will entice customers. Also, give things away free - we have a drinking fountain in our yard with a sign on it saying we are giving away free, drinking water. In the fall we give away fresh cider. In the spring we have maple sap for all to taste. A lot of people come to the stand from the city and they enjoy the atmosphere of the farm. So give them atmosphere. Have some farm animals (sheep, calves, chickens etc.) running about the yard. Create something to talk about. We have a real covered bridge on our place and it has become a landmark for our stand. Sometimes we get a customer so interested in the story of the bridge that we forget to sell him some sirup. But this doesn't happen often. A last comment is, "Don't cut prices to match Joe down the road." Set your prices to give yourself a fair profit and stick to them. If you lose a customer once in a while, the number that will pay your price for good products will far outweigh the occasional loss. This is because most customers won't know of the lower price down the road.

THE FUTURE OF BLENDED MAPLE SIRUPS

by

Fred A. Baxter, General Foods Corporation
White Plains, New York

I would like to begin by stating our views on the present status and future of the blended maple sirup market, and then fill in with the details as to how we arrived at these conclusions:

1. We believe the picture in blended maple sirups is generally pleasing.

2. Our probing into the future convinces us that this business is full of opportunity.

I hope you will agree with my premise that the present usually is a result of the forces at work in the recent past. So let's take a look at what has happened to the sale of both blended and pure maple sirups in the last decade. I might point out that the only portion of this business I feel qualified to discuss is sale of sirups through grocery stores. So all of my discussion will deal with sales in this type of outlet.

Our research tells us that sales of blended sirups through grocery stores in 1958 were 55% greater than in 1949. Every year during this period saw an increase over the previous year with the single exception of 1955. We also believe that the sale of pure maple sirup through grocery stores, while not increasing in its proportional share of total market, has about held steady. Thus, through the influence of a rising market, overall sales of pure sirup are up.

If you will recall, I said that the present picture for blends was "generally pleasing," so let's not look at this 55% increase by itself and spend the rest of our time this morning mutually congratulating ourselves.

If we add sales of imitation maple flavor sirup to those of blends and of pure maple in our definition of "maple" market, we find that this total market is up 75% in the last decade. Obviously sales of the imitations have been growing at a faster rate than the blends and pure sirups. Precisely, how much have these imitations grown in the last decade? I am sorry to have to report that this figure is 115%.

Now certainly percentages can be fooling and in this case they are because imitations started from a lower base than did blends and pure sirups. However, there is no comfort there either.

If we consider pure, blended, and imitation sirups as a whole, the imitations alone account for 54% of the total growth in sales in the past ten years. Putting it another way, in 1949, imitations had 35.3% of this market - in 1958 imitations had 43.9% of the market.

So I think you will agree that we can conclude while the last ten years have been good ones for us in the blended and pure maple sirup business, we have not kept pace with the growth of the sirup market.

We feel it necessary to consider an additional category of sirup, namely, light and dark corn sirups to properly analyze the sirup market situation. If we define the market as the total of pure, blended, and imitation maple sirups as well as corn sirup, we discover that this market has not been increasing in recent years; rather it is static. Therefore, we believe that what is happening is that there has been a shift away from light and dark corn sirups to imitation maple, to blended maple, and finally to pure maple sirups. In our opinion, because of price, the upgrading step from corn sirups to imitations is a much easier one for the housewife to make than from corn sirups to blends and/or pure maple.

Let me point out here that this shift in the pattern of brand and category is a constantly changing thing. The housewife who consistently buys one brand or even one category is pretty rare. For instance, we know that Log Cabin accounts for only little more than half of the total sirup requirements of a typical Log Cabin buyer. I think we have to face it that every time Mrs. Consumer goes to the sirup section of the supermarket, every brand and every category is battling for her favorable decision - and just because a particular brand or category wins once is no promise that it will win in the future.

But to get to the "WHYS." The average 12 oz. bottle of imitation sirup is from 7 to 8¢ cheaper than the average 12 oz. bottle of blended maple sirup. This price differential apparently has a greater effect on the larger user of sirup than the small or occassional user. This is natural because the total effect of price of sirup is greater on the food budget of the woman who buys it often than it is on the budget of the housewife who buys it only occasionally. For instance, during one six months period last year, 25.2% of the families in the United States bought some kind of blended maple sirup, while 18.1% of the United States families bought an imitation. But each of the imitation maple sirup buying families purchased an average of 5.6-12 oz. bottles, while the average blend buyer bought only 3.7-12 oz. bottles.

What would happen to the blended maple sirup business if we were able to get people who are imitation maple sirup buyers to change and become blended sirup buyers? Oversimplified, this accomplishment alone could increase the blend business approximately 67%. So it seems to us that it is incumbent on everyone with an interest in the blended maple sirup business today to do everything possible to keep these sirups as competitively priced as possible in every step of distribution.

Now it is no secret that General Foods is a strong believer in consumer advertising as a marketing tool to overcome inroads by lower priced products. If I may, I would like to quote from the Product Philosophy on General Foods sirups as to how we feel about advertising for Log Cabin Sirup:

Advertising should always strive to be:

(1) In unquestionably good taste - It should build a common bond that allows the purchaser to identify herself and her family favorably with the product.

(2) Not only truthful but credible - It should, of course, be accurate in all claims for product performance. This does not preclude obvious hyperbole, but exaggerated claims or even true claims that seem unbelievable to the average consumer, must be avoided.

(3) Reflective of product quality - The reproduction - the illustration - the accessories - the situations - and the people should communicate a quality impression - not a "quality" beyond the reach of the average consumer, but a "quality" with which they would like to identify themselves.

(4) Rewarding to the consumer - It should always contain an element of persuasion toward satisfying a need or desire of the purchaser and of her whole family. Advertising should offer the consumer a promise of family enjoyment. For the most part, pancakes and sirup are a family affair. This can be incorporated in any part of the advertisement or commercial.

We believe, and there are other advertisers of brands of blend who feel as strongly as we do, that one of the most effective forces in selling quality products against price competition is consumer advertising. We only wish that there were more dollars available to us and by manufacturers of other brands of blended maple sirup to be spent in advertising this product. When you compare money spent for advertising blends with the total amount spent for all food advertising, that used for the blended sirups is not of great magnitude.

We would like to suggest, however, that it is possible for consumer advertising to do three things for blended maple sirups:

1. Convert nonusers of pure and blended sirups to users.

2. Increase the rate of use among blended sirup users.

3. Create and promote new ideas.

We try to accomplish one or more of the above objectives in every advertisement that Log Cabin puts out. I would like to discuss some of our recent advertising with you.

NOW FOR THE FUTURE

In checking around for subject material for this discussion, I chanced upon the notes of another blended maple sirup market procrastinator from General Foods who discussed this same subject with you some six years ago. Many of you may

recall Hugh Conklin. He concluded his remarks in 1953 by saying that sales of blends and pure maple sirup in 1956 would be 25% greater than they would be in 1952. Actually, they were 16% greater. It can be said that General Foods produces optimists if nothing else. It seemed to me in looking over Hugh's analysis of the future of the maple industry in 1953, that he said many things which are still true today and the thought occurred to me that there is little reason to change his observations.

Let me quote what Hugh thought were the six most important factors affecting the sirup business in 1953 and make a few observations as to why, in my opinion, they have changed little:

1. "The size of the maple crop and the availability of this product for either straight or blended sirups. This is so obvious that it needs no explanation."

   Observation: Still most obvious

2. "Technological improvements for the industry as a whole are of great importance. There have been no significant major technological improvements in the harvesting and processing of maple sirup in the past half century. This is practically the only agricultural commodity in which such a condition exists. There is a crying need for increased efficiency so the farmers can harvest a maple crop, sell it at a profit, and still not price the commodity out of existance."

   Observation: Much progress toward this objective has been made since 1953.

3. "The future of the industry will depend in great measure on general political and economic conditions. This implies a stable international situation and a continuance of prosperity. We believe that both of these conditions will prevail, although we probably will not continue to experience boom prosperity such as we had in the past few years."

   Observation: Mr. Conklin missed slightly on his forecast for the country's overall prosperity. However, the fact that these conditions are necessary for a healthy future in the sirup business still applies.

4. "The price of maple and resulting price of sirup is a very important factor affecting the future of the industry. Undoubtedly, the price of the product will depend in large measure on the three factors mentioned above. There are indications that if the price of maple goes up further while other commodities, particularly cane and corn sugar, remain at their present levels, maple products can see a decline. If the price can remain stable or decrease, it will brighten the future."

Observation: The recent growth of imitation should make this statement achieve the mantle of "real prophecy." I can only once again underline its importance in our whole future planning.

5. "Increasing population in the country is bringing two and one-half million new consumers into the market each year. Fortunately, sirup is the type of commodity which children start consuming at an early age and continue consuming through their lives. This increasing population can be a vital factor in the growth of the industry, if marketing practices are geared accordingly."

   Observation: As true in 1959 as it was in 1953.

6. "A continuing growth for the industry is dependent upon an educational job which producers and packers of sirup are willing to do on consumers. There is a great competition from all sides for the consumer's dollar. It is important that the sirup industry continue to expound upon the benefits of maple and blended sirup, particularly considering the rapid growth of the country and the new consumers that need educating in this commodity each year. At the present time this educational job is being borne exclusively by the blenders."

   Observation: This one should be carved in stone.

My own personal estimates for the future of the blended sirup business has to be slightly hedged because I believe that our industry still has to become adept to the problem of handling the competition from imitation maple sirup. In one sense of the word the imitations have done blended and pure maple sirups a tremendous favor. They have exposed a large number of people to maple-like flavors who probably never would have been exposed if they had to jump from less costly corn sirups to the more expensive maple blends all in one step. Whether or not the blends capitalize on this real great opportunity still remains to be resolved. If we can cope with this situation - admittedly both a problem and an opportunity - I see no reason why the next decade should not be as successful as the last decade has been for the blends and pure maple sirups.

A NATIONAL MAPLE SIRUP COUNCIL

by

Milton Thibaudeau, Luxemburg, Wisconsin

I have been asked to attend this conference to convey to you some of Wisconsin's views on establishing a National Council for our maple sirup industry.

By way of introduction, my wife and I own and operate the Four Seasons Maple Sirup Camp at Luxemburg, Wisconsin, which is 20 miles east of Green Bay, 125 miles north of Milwaukee and 12 miles west of Lake Michigan. Our Camp's previous owner built it up to 2400 buckets using the sirup only as gifts. We took over in 1937 and have built it up to a 3,000 bucket operation and in

addition we are buying considerable sap from our neighbors. We first sold only to consumers. Later we included retailers. During our ownership we have changed to mechanized tapping and haulage. We even have a snow plow. We have also changed from wood to oil-fired evaporators and we use two 3' x 12' Vermont evaporators. We did experiment with vacuum evaporators and learned the hard way that they were not for the small sirup operations.

Let us get back to the reason for my being here, namely to discuss the formation of a National Maple Sirup Council. But first, let us consider the words "council" and "counsel." The first, according to Webster means an advisory body or a low making body while the second means to give advice, interchange of opinions, to recommend. We ought to work along the lines of the word "counsel."

If we bring to life and foster a National Council to the point where it will be of value to us we should start with a sound foundation, i.e., give it a realistic name. Its title should inform the public that we represent the maple sirup industry. Such a name could be the National Maple Sirup Council. If we form such a council what can it do for the maple sirup industry?

(1) Should it sponsor and establish National standards for maple sirup?

If maple sirup is the same regardless of where it is produced then such standards should be in order. They would eliminate unfair competition from low grade molasses-like sirup and from the watery, thin ones. If new standards are set up consideration should be given to how they are to be enforced.

(2) Should the council sponsor or supervise the labels of maple products?

Definitely the label should make the public aware of what is in the package. It should be neat and give the grade and other important data.

(3) Should the Council serve to equalize supplies of maple sirups? Could it work out methods to dispose of localized surpluses and stabilize sirup prices by keeping surpluses at a minimum? What about development of markets in non-producing states?

Investigation of sirup transportation costs, development of better shipping procedures, cooperation with sirup blenders and instigation of studies to determine the affect of blends on sales of pure maple sirup are other possible areas of Council participation.

(4) Should the Council work with governmental agencies for the establishment of sirup ceiling prices if and when necessary?

Many of you will recall that prices for first and second grades were set alarmingly low during 1941 to 1946. The so-called "industrial grade" was outside of these controls and the sellers took all the traffic would bear and more.

(5) How can the manufacturers of maple sirup equipment be helped by the Council? Could it avert the conditions of 1941 to 1946 when only 5-gallon cans were available for packing sirup? Should the Council obtain information regarding the best form, size and material for sirup containers?

Cooperation with price control boards, if the occasion arises, by having essential data available is another possible endeavor.

(6) Should the Council cooperate in the development of new equipment?

Investigations could include the following: different fuels for evaporators, improved evaporator designs, new filtering media, other method of packaging, and bottling machines.

(7) Should the Council serve in an advisory capacity by recommending areas of needed research for the maple industry and to excercise its perogative in sponsoring this research?

Examples of immediate needs in this area are: improved sap handling procedures for better quality sap, better processing equipment and methods for processing sap to sirup, the development of new outlets through new or improved products, better marketing procedures, and methods for control of maple tree diseases.

(8) To what extent should the Council sponsor the advertising of maple sirup?

The council could help materially in advertising campaigns, but a clean plant, clean equipment and a top quality product are essential for good advertising.

(9) How should a National Council be financed?

Possibilities for state and federal aid should be investigated. However, I am not in favor of state or federal aid, instead I am in favor of taxing the producer. At any rate, some method of financing will need to be worked out.

(10) What action should be taken on creating a Council Bulletin?

A nation bulletin could be sponsored by the Council to keep maple producers informed not only of the activities of the Council but of such other important items as: sirup production by states, sirup sales and prices, and new developments.

(11) Should the Council study the effect of Canadian maple sirup imports on American production and sirup prices?

This is extremely important, for our production has decreased from 3,973,125 gallons in 1916 to 1,516,000 in 1958 while imports from Canada for the same period have increased from 334,625 to 1,408,477 gallons. What is to be done about this situation? Should our production be raised and should we discourage imports through such means as a higher tariff? These are problems for a National Council to consider.

I wish to emphasize, in conclusion, that if a National Maple Sirup Council is formed we should not lag behind in giving it all the help we can. Remember a Council should have some rights to row the boat. With the help of all we will have the power to guide the rudder.

NOTE: During this conference a group representing the different maple organizations met to give further consideration to formation of a maple sirup council. The minutes of this meeting, and a subsequent meeting of the newly formed "Council" are given in the Appendix of this report.

THE MAPLE INDUSTRY IN THE PROVINCE OF QUEBEC

by

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The main characteristics of the Quebec Maple Industry, these last years, could be enumerated as follows: a trend towards a normal annual production (30,000,000 lbs. of sirup), the supply of an increasing American export market, and the recovery and stabilization of its domestic market plus an increase of its exportation into the other Canadian provinces.

1. Normal annual production:

What do we call a normal annual production in Quebec? An average, calculated for periods of 5, 10, 15 and 20 years may give us the answer. The average for 20 years was 29,181,470 lbs. which was also the amount produced in 1937. The average up to 1940 was 28,000,000 lbs. From 1941 to 1951, with 1947 excepted, between 27 and 28 million pounds were produced annually. From 1952 to 1959 the average was between 28 and 30 million pounds. Thus, the average for the past 42 years is approximately 30 million pounds. This value of 30 million pounds, is referred to in the Province of Quebec as a normal crop.

The number of trees tapped annually over a 30 year period has remained rather steady and is estimated to be 32 million. This value is arrived at in a number of ways. Canada, Federal and Provincial, has had in effect a plan by which maple producers have been aided financially.

in replacing old sap buckets with aluminum ones. The producer pays only 1/3 of the bucket cost. So far 18,675,000 old buckets have been exchanged. This figure being a firm one, furnishes a good base figure for the number of trees tapped. In addition, a 1958 survey has shown that about 3-1/2 million old buckets have yet to be exchanged for the aluminum ones. The reason for the producers not taking advantage of this subsidy are numerous. However if we add the two values, 18-1/2 million and 3-1/2 million we obtain 22 million as a figure that represents the number of trees tapped. Perhaps this figure may be too high by 15% since annually a number of the 22 million buckets are not hung for various reasons, such as too much snow, sickness, shortage of labor or high labor costs. Not withstanding the numerous adverse conditions and the fluctuations caused by the seasonal weather the average production has been closely approximated annually in Quebec for the past 10 years.

Why is this production figure so constant? First, about 25,000 farmers have sugar bushes, second, the farmer generally taps his trees in time to obtain the first run of sap. Only once in 20 years (1953) was this timing off, so that the first run of sap was not collected. The dates of tapping in Quebec vary from March 10th for the warmest regions to March 22nd for the coldest regions. Third, the use of better equipment; which includes improved spouts, covered buckets and efficient evaporators. The effect of the latter was expressed by one of their agronomists who said "We still have small crops (maple) but no more bad ones, and the credit goes to the improved spout."

2. <u>The American Market</u>

Close to 50% of the Canadian maple sirup crop is exported annually to the United States. The volume of sirup previously used by the tobacco industry has been more than compensated for by the volume that is being used by the blended sirup industry. Increased quantities of pure Canadian maple sirup are now being sold directly on American markets in almost all of the maple states, most of which cannot meet 100% of their requirements.

3. <u>The recovery and stabilization of our own domestic market:</u>

The high wholesale prices paid for maple sirup in the Province in 1954-55 caused our farmers to neglect the retail market. 1956 brought a heavy crop. The export trade kept a normal level, but a low local demand for maple products in 1956-57 caused an accumulation of costlv sirup hard to dispose of. The problem was brought to the attention of a Special Board. After analysis, advice of economists, representatives of the Maple Industry and government officials and from direct surveys, the cause was found to have been neglect of the domestic market the previous years. The cause was so obvious that it mislead even the experts. All kinds of suggestions were made to solve the problems, even to amending the law for the processing of blended sirup in the Province of Quebec. It was suggested to the producers in general by the officials of the government, and to the members of the Co-operative by their own directors, to sell a larger volume of their products directly to the consumer, stressing the importance of quality and attractiveness of packaging in small containers. All these recommendations were backed by a publicity campaign. Finally, this market was not only

recovered but strengthened in 1958-59. A large can manufacturer gave us these figures representing his sales of lithographed maple sirup cans in the Province of Quebec:

1956	289,000
1957	200,000
1958	707,000
1959	460,000

4. Increased exportation to the other Canadian Provinces:

Through a national publicity campaign, sponsored by the Coopérative des Producteurs de Sucre, the distribution of pamphlets, articles in newspapers and local magazines, people became more acquainted with our products. We must add that a decline of production in New Brunswick and especially in Ontario (1959) enabled us to profit by an increased market in these two maple sirup producing provinces.

Here are a few statistics compiled by the Quebec Bureau of Statistics which show that the production has increased in Quebec in 1959, producing 100,000 gals. in that year. If the total 1959 Canadian production has declined in comparison to 1958, it is on account of a heavy decrease of production in Ontario and in New Brunswick.

The quality of the 1959 crop is slightly inferior to that of the 1958 in the Province, but not in volume. If the statistics state 14.4% as "A" against 30.2% in 1958, it is another index that a heavy percentage of the crop, necessarily of the higher grades, has been offered directly to the consumer. You are aware that according to our regulations, small quantities of sirup do not have to be graded by the government, and so escape statistics.

CONCLUSIONS

Certain conditions prevailing in United States and Ontario are not felt so acutely in our Province. We are led to believe that more and heavier demands for maple products can be expected, and that our Province will be looked upon as the logical supplier.

Will we be able to meet this challenge?

The answer is YES. As mentioned previously, Quebec remains with an immediate potential of 22,000,000 maple trees which can be tapped annually. These trees, even if not tapped every year, have not been timbered. We can also rely on a comfortable reserve of some 30,000,000 trees, which have never been tapped on account of their inaccessibility, but new roads are gradually opening these territories.

Furthermore, we may say that notwithstanding the ups and downs of the past and the difficulties that it had to overcome and will have to face again, our Quebec Maple Industry is sound and healthy, and is bound to remain as such, for the following reasons:

(a) The improved equipment now at the disposal of the majority of producers;

(b) The large area of the Province and the marked differences of temperature prevailing from one end to the other, the density and even distribution of maple forests throughout the whole territory led us to hope for an average crop annually. If the south-western crop is hampered by a mild temperature or other adverse conditions, the north-eastern districts make up for the decline, and vice versa. This is what happened this Spring;

(c) The Coopérative des Producteurs de Sucre, with over 6,000 members responsible for 45% of the total crop, is an asset and may be considered as the backbone of the Quebec Maple Industry;

(d) A close government inspection of all maple products, whether they are for export or local trade and the maintenance and enforcement of the Regulations;

(e) Last but not least, are the results of the work of the teams of foresters, agronomists, and experts in numerous fields of the Maple Industry, whose collaboration has made it an annual cash crop of $9,000,000 to $12,000,000.

NEW DEVELOPMENTS IN THE NEW YORK MAPLE INDUSTRY

by

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Ithaca, New York

The maple tree has had a profound effect on the history of New York. Settlement of much of the state by the Holland Land Company was made where there were great tracts of sugar maple. Exploitation continued to progress until the Louisiana Purchase when cane sugar successfully began to compete with the Northern New York sugar supply.

Since then maple sugar has declined as the sweetening agent and maple sirup has become the prime product and since World War II the industry has tended to remain about constant as far as the total volume of sirup produced is concerned. In the latter half of the post-World War II period significant changes in production techniques have tended to make many producers grow in size of operation and many smaller operators to drop out. This has been due to better marketing techniques, better quality control and development of a year-round business.

Production Improvements

For many years the progressive maple producer has been striving to improve quality, reduce labor and get better income from his operation. Probably the first step toward improvement of quality on a general scale came with

the introduction of the plastic bag for sap gathering. Though the plastic bag was either completely accepted or thoroughly disliked by the individual producer, it did one thing for the industry -- it opened the eyes of a majority to the fact that clean, nearly bacteria free sap could be obtained--and obtained for a longer portion of the sap season.

The next step was the adoption of plastic lines by a few innovators in Western New York. With improvement over the years, largely sparked by the producers themselves, plastic lines, in many forms and types, opened up large areas of steep hillside bushes hitherto untouched because of the impossible gathering conditions. In most bush operations buckets were not abandoned, but plastic lines were added and brought in labor efficiencies which were used to expand production. Buckets were largely confined to areas more easily gathered. Plastic lines reduced the strenuous physical labor normally associated with the collection of sap. It also made it possible to better utilize pipes and pumps for sap pickup from central gathering tanks. In many cases it meant the use of fast moving vehicles such as trucks and wheel tractors to move sap from the bush to the sap-house. With these vehicles a trip of 10 to 15 miles to pick up sap was no drawback.

Cleanliness in handling sap has been stressed in very recent years by most operators. The fact that the sap from plastic lines was free of debris, dirt, and to a large extent, bacteria has pointed up the need for cleanliness in sap handling from normal tapping methods. Starting with "sterile" tapping, (dipping the tapping bit in chlorine solutions); carrying the "sterile" spiles in chlorine and driving them while wet; and later treating the tap hole and bucket with a solution of chlorine to reduce the bacteria count has helped to increase the cleanliness of the operation and raise quality for a longer period or until "buddiness" appears. A further filtering of sap from gathering tank to storage tank has increased quality. A noticeable result has been cleaner pans in the evaporators, and consequently a lighter amber color to the sirup.

Evaporation changes have been a result of increased production of sap. One of these changes has been to go to large evaporation rigs--not larger evaporators but two or more evaporators or evaporator pans run in series. By and large, regular evaporators 12' to 14' in length have proved to be more efficient than longer rigs, say 16' to 20' long; two or more in series, fed by gravity have been the rule on many installations. Heating agents in use range from wood fires, oil fires to steam. The latter being very easily controlled and giving the highest quality sirup. In the series operation labor is very efficient for one man can fire several evaporators and with proper tools (thermometers, automatic drawoffs, etc.) continuous drawoff may be attained either at standard density or at any point desired.

Many operators now draw sap off at about 60° Brix, filter it and then finish it off in gas fired or steam heated "batch pans" where control is easy and accurate. Filtering after finishing is of course done. This has assured quality.

The elimination of the steam problem has been attacked in a new way with the use of the covered evaporator. At present one is in operation in the state but with the apparent success achieved by a single year's operation this new idea will spread rapidly.

With the above refinements in production techniques by many producers it follows that the end product must be of better quality; more nearly standard and, with larger production, available during the whole year. Markets then tend to expand. Many small operators, on the other hand, who have poor equipment such as houses, evaporators and filters and consequently produce for a bulk or a second-rate market. As a result their return per hour for labor tends to be low.

Conversely the operator who has tended to expand has more modern equipment, housed in excellent evaporator house serving both as the factory and the sales room. Such operations need more sap than the owner can produce thus has developed what has come to be called the "central evaporator house." At first such operations will tend to purchase sap from one or two producers with both the seller and buyer feeling their way along. Usually both parties have been satisfied and as a result the transactions grow.

This has meant that the central evaporator owner must and does develop new techniques of operation and new equipment. The first step is to develop a system of handling purchased sap, i.e., good dumping stations; calibrated tanks for volumetric measurements; accurate hydrometers for sap sugar tests; pumps to move sap to and from storage and a good bookkeeping system for the records of the producer. In addition storage must be built to hold sap at low temperatures so that the peak production periods will be cared for and the work load at the evaporators leveled out. Next, such evaporators need accurate, easily read instruments to test for sirup and a filter capable of handling large production. In some cases even storage for bulk sirup may be needed. Several producers have taken many or all of these steps.

Such central evaporator houses have been good for the industry, since it has tended to raise the quality of the product. In most cases both parties have been well satisfied with arrangements for purchase of sap. It often occurs that the central evaporator owner has more offers of sap than he cares to accept.

Not all problems of such arrangements are solved as yet. Volume and sugar content of sap can be measured. As yet the quality cannot and, if and when the laboratory here develops a quick test for high bacteria count and "buddiness" then the sap buyer will be all set. Until that time he must control quality by contract and education. One operator has succeeded in having his producers disinfect tap holes a couple of times during the season by refusing to take sap where this is not done. Buddiness control is more difficult but usually sap producers have been happy to shut off when told, but it remains for the buyer to know the bush where the sap comes from and curtail operations in time or store sap from each bush separately.

Marketing

Markets in New York have been changing over the past decade. They have been influenced by several factors but the main ones are as follows:

1. The higher quality product brought about by better, more modern equipment housed in easily accesible roadside sugar houses.

2. The development of family enterprises involving the husband and wife; the father and son family combination, or brothers working together in the operation.

3. Population shifts in parts of the state, notably northern New York, where industry has brought in new populations and such tourist attractions as the Seaway have opened up new markets by better tourist use.

4. In the last eight to ten years there has been a shift in customer preferences for maple products. In the past, sirup in gallon cans had been the large retail outlet. Now smaller containers such as pint, quart and half gallon sizes take more sirup than the gallon size in some areas. Other products such as maple sugars, both hard and soft, and maple cream are taking increasingly larger percentages of maple sirup.

One of the most significant changes, and one I believe to have the most influence on maple production, has been the growth of the family enterprise. Of the outstanding maple producers and marketers in New York 90% are family operations involving more than one individual and in many cases three or four in the same family. This is a logical sequence of events since it is rare that one person is adapted to production of sirup, manufacture of products, packaging, and marketing of these products.

To help the movement along the Extension Service has held its county winter meetings in some few counties emphasizing the part that the homemaker can play in the maple enterprise. This has been done by the Agricultural Agent in cooperation with Home Demonstration Agent and the Extension Forester, an Extension foods specialist and members of the State Department of Commerce. These have been successful in the counties where they have been held and increased interest in maple cream, and maple sugar packaging of all maple products in these areas has been the result. Another encouragement has been the increased emphasis on maple cream, maple sugar and other products on the annual producers tour held each summer. At such tours it is usual to have the family demonstrate their methods, equipment and products for the other producers on tour.

Family operations have tended to build up the value of the maple business. Bulk sirup, in most cases, represents the lowest profit for the enterprise, but still profitable for those not interested in marketing their products.

Retail sirup is the next step above this, but by putting more family labor into the better packaging of sirup; the manufacture of maple products, and by holding sirup for better sales periods such as the tourist season, hunting season or Christmas (in other words, a year-round market) income to the family has increased. In fact in many cases now a small carryover from one year to the next is looked on as a good insurance policy rather than a drawback. With family operation of the maple business it is accepted that the size and volume of business will grow to any point the family wishes it to. The market is there and only needs to have sap produced to satisfy the needs.

Summary

To summarize briefly, New York's maple production is maintaining a relatively constant level at present, with fewer but larger producers. I believe that the start of this decade will see increases in maple production over the decade just past.

This will be brought on by opening up more new bushes on steep land through use of plastic lines, and increasing production by increasing the amount of quality sap by tap hole disinfection. Quality has been and will continue to be increased by larger operations, more efficiently run, with better evaporating procedures, better quality control and more business-like sap house-sales room arrangements.

Central evaporation by larger producers is now in operation, and it will be increased because of its better quality, better labor efficiency and the fact that the business is a year-round one to satisfy the year-round market.

Family enterprise is rapidly increasing in the maple business. With more hands, more ideas and more skills these family enterprises are developing better products, better markets and better incomes for the maple industry. It will continue to grow especially in what may be termed the "underdeveloped" maple areas of northern New York where drastic population changes and tourist developments are taking place.

MAPLE SAP FLOW THROUGH PLASTIC TUBING

by

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The use of plastic tubing to reduce labor in gathering maple sap is now an established practice with some producers. Others are awaiting more information on tubing cost and longevity as compared with labor savings, and more information concerning the effect on the amount and quality of the sap. Large scale experiments at Cornell's Arnot Forest have been concerned primarily with the flow of maple sap through tubing.

The effect of plastic tubing on sap flow can be thought of in two ways: (1) effect on the amount of sap obtained at the tap hole and (2) effect on

total sap flow caused by restrictions or loss in transport from the tap hole to the collecting tank. A recent test at the University of Vermont (1) gives some information on the former point. Sap flow from tap holes with ordinary metal spiles, buckets, and covers was compared to that from tap holes which had a special plastic and aluminum spile connected to three feet of tubing leading to a bucket on the ground. Each of 40 trees was tapped by each method in 1955. The tubing setup yielded about 25 percent more sap during the season, and was superior on most individual runs throughout the season. Two possibilities for this superiority were suggested: (1) the spiles were unshaded by metal covers and could thaw more quickly on cold mornings and (2) less air-borne infection reached the tap holes.

The effect of a tubing system on transport of the sap is much more complex and any restriction can only cut down the flow. The first extensive experiments at the Arnot Forest took place during the 1958 season and are given in detail elsewhere (2). The principal results are reviewed here, however. Approximately 600 tap holes were made, of which about a third were on hillsides with tubing, another third were on nearly flat ground with tubing, and the remaining third were near the road with the usual metal buckets or plastic bags. Over the entire season, the hillside tubing yielded 80-90 percent as much sap as the regular buckets. The flat ground tubing, however, yielded only two-thirds as much, and one small area where sap had to flow uphill yielded only half as much sap as was obtained in the buckets.

Both hillside and flat ground tubing lagged behind the buckets in early season and all three methods were nearly equal in midseason. In late season the hillside tubing continued nearly equal with the buckets, but the flat ground tubing lagged badly especially near season's end.

The lesser flow in tubing early in the season is attributed to the small portion of the day that the lines were free of ice, compared to the time that the trees were ready to flow. Often freezing occurred in late afternoon, and the trees were ready to flow by late morning of the following day. Final thawing of ice in the line might be delayed as late as mid-afternoon, however, and only a short flow could take place before sap froze in the line again. With warmer weather as the season progressed, night freezing was delayed and melting of ice was hastened. Even when ice in the line delayed the start of a flow, there was a tendency for the flow to last longer in the night and compensate for the late start. Thus sap flow in tubing was less than that in buckets in early season, but hillside tubing was about equal to buckets in mid and late season.

Sap flow in flat ground tubing was greatly diminished toward the end of the season, however. Recent work by Marvin and Greene (1) helps to explain why. They described a weeping flow, which may occur for many hours after tree pressure has dropped almost to zero, and how little resistance is required to stop such a flow. Their findings on reabsorption of sap by the trees, sometimes while other trees continue to flow, are also of interest here. Since weather conditions are more suitable for

weeping flows in late season, the poor sap flow through flat ground tubing can largely be attributed to insufficient tree pressure to overcome the friction of the tubing line, and to a certain amount of reabsorption of sap. This reabsorption can also be a means of spreading microbial infection and may account for the fact that some flat ground lines failed to produce during the last one or two flows of the season.

The 1958 experiments were largely duplicated in 1959 at the Arnot Forest. However, because of apparently deeper soil freezing in some parts of the sugar bush than others, sap flow results are not entirely clear. Nevertheless much information was gained.

For the entire 1959 season there was no significant difference between hillside tubing production and bucket production. In spite of possible influence of differential soil freezing on the sap flow, it appears that hillside tubing can produce as much sap as buckets if proper field procedures are followed.

In the case of flat ground tubing, however, the 1958 results were largely duplicated and sap flow was only about two-thirds of that where either buckets or hillside tubing were used. The decreased flow was apparent all season long, but especially pronounced in the last half of the season. Again some lines had little or no flow during the last one or two flows of the season. Further analysis of both 1958 and 1959 results gave some indication that small areas flowed better than large areas. In both years, collecting areas of only 7-11 tap holes flowed about 20 percent more than collecting areas of 14-20 tapholes, although the results were not statistically significant in any one year. One larger area of 43 tap holes flowed quite well in 1958, but yielded only 8 quarts per tap hole in 1959.

Kind of Tubing

The limited tests at the Arnot have shown little over-all difference in sap production between Naturalflow and Mapleflo tubing, the two brands known to be commercially available. The former tubing is larger and can accommodate at least twice as many tap holes* as the latter; the former is also a little cheaper and easier to handle. Some tests were also made with a thin-walled tubing designed for cheap manufacture and discard after a season's use, thus eliminating cleaning costs. This thin-walled tubing was difficult to handle and assemble in the field, and the cost apparently cannot be lowered sufficiently to allow it to be discarded after one year.

Venting

The need for venting plastic lines is not well understood. Long unvented lines on steep hillsides are sometimes collapsed by the vacuum created by sap flow. Weeping flows in late season appear to need proper venting to make the

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* Rate of sap flow on hillsides is greatly increased with a small increase in diameter. It also increases with an increase in elevation and decrease in length of tubing.

flow continue downhill. In one case, where the tubing was disconnected at the base of the tree, the sap would not flow out of a four foot long spile section until the top was disconnected from the spile. This suggests that every spile needs a vent in late season. Proper venting may be needed, not only to induce sap flow in the tubing, but also to prevent microbial infection spreading from one tap hole to another. Until more is learned of this matter, we shall continue the practice of venting once for every 15-20 tap holes.

In the early part of a sap run, before all the ice is out of a line, the sap runs uphill and out the vent. The amount of sap lost in this way was measured in 1959 and found to be as much as 20 percent of the flow. Losses were particularly heavy percentagewise, where there were only a few taps on the line, when sap in the lines froze commonly, and on some warm days of weeping flows when the sap flowed uphill and out the vent rather than downhill through the tubing. Such losses indicate a need for either a special vent which will shut off sap flow or a reservoir which will return the sap to the line when flow conditions are again suitable.

Animal Damage

To date there has been no damage to tubing lines by deer. Rodents are another matter, however. Based on a claim that a rodent repellent had been incorporated in a leading brand of sap tubing, tests with field mice were conducted on the tubing at Cornell. Sections of new tubing cut from the commercially available tubing in 1959, as well as some from 1958 tubing, were fastened on a wood board and placed for three days in a tank containing 10 well-fed field mice and an amply supply of corn and cabbage. The mice chewed holes in all the tubing and even chewed at the board. Most damage was done to Mapleflo tubing, perhaps because the plastic material was thinner and softer. Least damage was done to the relatively hard and thick Naturalflow tubing. Since all kinds of tubing were subjected to attack, as well as the board, it was concluded that the mice were motivated by natural curiosity and a need to use their teeth to keep them sharp and not by any taste preference. This is further substantiated by the fact that in another three-day test made a week later with the same mice, there was somewhat less damage done.

In the field in 1958, there was only one hole bitten through a plastic line at the Arnot Forest, and this occurred near the end of the season. Perhaps the deep and lasting snows of 1958 helped prevent attack. In 1959, when snow cover was less than usual, much more damage was done. Although no culprit was apprehended, it is believed the chewing was done by red squirrels, as an overabundance of these animals was evident the previous fall and winter. About 25 percent of the plastic collection areas had leaks caused by holes bitten in the tubing. Much of the damage occurred in the middle of the season, but sporadic attacks were made throughout most of the season. It was interesting to note that the same part of the line was sometimes attacked repeatedly, indicating that only one or two animals may have been responsible. Again no preference for

tubing was discerned, as all brands and makes of tubing were attacked in about the same proportion that they were used. It was most usual to have bites near fittings, but some occurred in the middle of a line. Even aerial tubing was bitten in the air several feet away from a fitting. Thus leaky fittings cannot entirely be blamed for provoking attack. These observations again indicate that the principal motivation involved is very likely a matter of curiosity rather than taste preferences.

What are the economic consequences of rodent damage such as occurred in 1959? Had corrective measures not been taken, the sap loss may have amounted to about 20 percent of the season's production. At the Arnot Forest, however, corrective measures were quickly applied, and the sap loss was reduced to perhaps only one or two percent of the production. The tubing was patched, either by cutting off the damaged part near fittings or by inserting couplings in the middle of lines. Cost of additional tubing or fittings was practically insignificant. The principal economic consequence of rodent damage was the additional time required to find and correct holes in the line. This is best done just after the start of a flow for the following reasons: (1) Detection of leaks is simplified when sap is flowing and (2) the correction should be made before any large sap loss. The following procedure was used to detect leaks in lines, whether or not caused by rodents:

(1) Inspect lines when they are pulled from the snow. If the latter is not necessary, inspect lines at the beginning of every third flow anyway.

(2) On days when lines are not inspected, look for reduced flow of sap at the collection point. On flat land, even a somewhat weak flow indicates the lines are probably intact; otherwise tree pressure would be lost through the leak.

(3) When inspecting lines, look for sap flowing in the wrong direction or holes made in the snow by dripping sap. Also look doubly carefully where there have been previous attacks.

(4) Keep records of production for the collection cans or tanks. At time of collection, note any important changes in production.

This procedure made it possible to find and correct leaks with little sap loss and with little additional time required. This additional time requirement was only about a half-minute per tap hole for the season. Moreover, since the squirrel population was at a peak during the last year, it is likely that following years will be less troublesome on the average.

Summary

When properly used, plastic tubing maintains good sap flow on hillsides. It is a useful tool which will find more and more users although it will not and should not completely replace buckets. Perhaps its most important economic value has not yet been mentioned--its influence in expanding future production.

The Arnot Forest has already demonstrated how this may be done. First the Forest has mainly scattered small groups of trees on steep hillsides, an inaccessable and uneconomic place for sirup making before plastic tubing was available. Second, economic sirup making would have been impossible at the Forest in the very deep and lasting snows of 1958 without plastic tubing. Thus plastic tubing is not only here to stay, it may help revolutionize the industry.

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A COST ACCOUNT OF PLASTIC TUBING vs. BUCKETS FOR SAP COLLECTION

by

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After making maple sirup all our lives for our own use, we started to produce it commercially in 1945. We hung only 600 buckets and made about 300 gallons a year for several years. Then we began to wonder if the operation was profitable. Like most producers, the main reason we make sirup is to make money. When we increased the number of buckets to several thousand, we started keeping a cost account of the different steps in production, such as tapping, gathering and washing equipment. We found that tapping and washing were a minor item, so we concentrated on gathering. By changing our equipment for greater efficiency, we cut our cost in about four years, from $1.25 to $0.61 per gallon of sirup while our labor cost rose from $1.00 to $1.25 an hour.

When tubing was introduced a few years ago, we were immediately interested in it as a means of improving sirup quality and lowering production costs. The initial cost of the tubing, or the amount of sap produced in comparison with buckets is not important. The one thing we are interested in is the total cost of enough sap to make a gallon of sirup. The only way to find this cost is to make a cost account of tubing versus buckets under actual production conditions.

The cost of producing sap with conventional buckets or plastic tubing is easy to determine, but very difficult to compare. To make an accurate cost account you would have to have a large number of trees all the same size, growing on the same type of soil with the same exposure. They should each produce the same amount of sap of the same sugar content. They should all be tapped on the same side, to the same depth and some provision made to

eliminate all bacteria from the tapholes. Since maple trees just don't grow this way, I have had to assume that each tap, whether a bucket or tubing was used, produced enough sap to make one quart of sirup. I used three types of sugar bushes in this cost account: First, our regular roadside trees tapped with conventional spiles, buckets and covers; second, roadside trees tapped with tubing using 20 gallon utility pails for the sap; and third, four separate sugar bushes tapped entirely with plastic tubing, each bush having the sap tubed to one or more storage tanks.

The initial cost of tubing per tap varies with the size and spacing of trees, while the cost of buckets, covers and spiles remain the same. On 1600 taps in bushes, our cost for tubing (based on a 1959 retail price list) varied from \$.79 to \$1.21 with an average of \$.96. On these installations we used storage tanks with a capacity of 2 gallons per tap. The cost of this type of container was \$.25 per tap making a total initial cost of \$1.21. On all types of installations we figured the life expectancy of tubing at 10 years, and all metal containers and parts at 20 years. On this basis our depreciation on tubing and storage for bushes was \$.11 per tap. Assuming we made 1 quart of sirup per tap on all types of installations, the depreciation per gallon of sirup produced is \$.44.

On roadside trees where the terrain is suitable for tubing, the cost of the tubing is less than in a bush: 108 taps averaged \$.59 per tap for tubing, and the cost of 20 gallon utility pails was \$.40 per tap making the yearly depreciation \$.08 per tap or \$.32 per gallon of sirup.

The initial cost of buckets, covers and spiles, (using a 1959 price list) is \$1.19 per tap. This cost depreciated in 20 years is approximately \$.06 per tap or \$.24 per gallon of sirup.

The labor cost of tapping was found to be about 3 times as much with tubing as with buckets. At \$1.25 per hour for labor, buckets cost \$.038 each or \$.15 per gal of sirup; tubing cost \$.12 per tap or \$.48 per gallon of sirup.

The cost of gathering sap from roadside buckets was \$.61 per gallon of sirup produced. Gathering from tubing on roadside trees cost \$.24 per gallon of sirup and from bushes the cost was only \$.11 per gallon of sirup.

The sugar content of the roadside trees averaged about 3% while the bush trees produced about 2% sap. If the sugar content had been the same, the difference in cost of gathering from buckets or tubing would be still greater. And, of course, if the sap from tubing runs directly into the sugar house storage tank, the cost of gathering would be nothing except for a little time spent in inspecting the lines which is a necessary operation.

Washing tubing takes about the same amount of labor as buckets with two exceptions. First, washing tubing is lighter and easier work than washing buckets and to make the same quality sirup with buckets as with tubing, we feel it is necessary to wash the buckets in the middle of the season. Our average washing cost for the past two years was \$.06 per bucket (two washings) or \$.24 per gallon of sirup. Washing tubing cost us \$.032 per tap (one washing) or about \$.13 per gallon of sirup.

Adding all these costs together we find little difference in the cost of producing sap with buckets or with tubing. The totals are -- Roadside buckets $1.24, roadside tubing $1.17, bush tubing $1.16. However, there would be a much greater difference in the total cost if we had compared buckets on bush trees with tubing on bush trees. It would probably cost more to gather sap from buckets in a sugar bush than on roadside trees, even if the bush is well located with respect to the sugar house. If we had used a cost of $1.00 to $1.25 per gallon of sirup for gathering from buckets, which is, I believe, a little nearer the actual cost of gathering for most producers, there would have been a much greater difference between tubing and buckets. Also, if the tubing will produce more sap per tap than the buckets, the cost per gallon of sirup would be still less.

We have never hung buckets in a sugar bush. The bushes we tap are several miles from our sugar house and it would be too expensive to gather with tractors or teams and then transfer the sap to trucks to haul to the sugar house.

The bushes we tap with tubing would not be at all suitable for buckets without a considerable expenditure in both money and labor. There are no roads through these bushes, the undergrowth is very thick and they are so steep in places that gathering sap from buckets would be practically impossible. Another factor favoring tubing is deep snow. It is not too difficult to tap in deep snow, but gathering is another story. In the past few years, many producers have found that deep snow stopped production completely, or was too expensive. Tubing almost entirely overcomes the snow problem. These things and others seem to favor tubing over buckets.

There has been considerable controversy concerning the sap flow from tubing as compared with buckets. Our results last year were as follows: roadside buckets - 7.7 gallons per tap; roadside tubing - 8.4 gallons per tap, and one bush of trees very similar to roadside - 8.2 gallons per tap.

As a summary I would like to say that we have had very good results with plastic tubing regarding the cost of sap as well as in the amount of sap produced. To those who have not had good results; do not condemn the tubing. Make your own cost account and see if you are producing sap cheaper with tubing or with buckets.

THE MECHANISM OF SAP FLOW

by

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A study was made of several factors which influence the flow of maple sap. By use of automatic recording devices, data, such as the rate of sap flow or variations in enviromental and tree temperature during an entire season, could be collected continuously. The influence of several factors on rate of sap flow and on total sap yield is discussed.

1. Temperature.

Sap flow is quantitatively influenced by the temperature prevalent during the day preceding sap flow. The number of degree-hours below freezing preceding a sap run, rather than the temperature rise during the flow period, determines the amount of sap flow during the following flow period. This "conditioning effect" contributes to sap flow even when the temperature has warmed to only 2-3° F. above freezing on the day of sap flow.

Maple stem tissues absorb sap following a flow. In closed systems, such as exist when tubing is used for collection of sap, reduced temperature permits sap absorption from the container into the taphole. The course of sap flow and absorption correlates more nearly with the twig temperature than with the temperature of the bark or of the wood near the taphole. In general, there is a marked seasonal effect on sap yield as a whole. However, trees which yield larger amounts of sap or which yield sap with a higher sugar content seem to possess these characters from season to season, indicating that these properties are constant and, in all probability, inherited.

2. Type of spout inserted in the taphole.

Sap yields were studied in trees containing spouts with a three-foot piece of plastic tubing attached. These data were compared with yields obtained from regular spouts. It was found that tube spouts consistently gave higher sap yields than did regular spouts. This difference could very well result from the decreased possibility of microbial contamination in the tube-protected spout.

Studies involving the use of valve spouts showed that when a slight resistance is present, which reduces the "weeping flow" of sap, the overall sap yield is diminished.

3. The gas in maple sap.

Since the gas present in maple sap may affect the flow in closed collection systems, its origin and composition were studied. It was found that the presence of large amounts of carbon dioxide were probably the results of respiratory activity of the tree tissue.

4. Disinfectants.

The effects of three disinfectants, ethyl alcohol, Clorox, and sorbic acid, on sap flow and yield were investigated. In general, higher sap yields were noted in disinfectant-treated tapholes containing the tube spout than in untreated controls with regular spouts. The striking observation in this study was that the length of the sap-yielding life of the treated tapholes was prolonged by use of the disinfectants.

When Clorox-treated tube spouts were compared with untreated tube spouts, these differences were not as pronounced since untreated spouts gave fairly high sap yields. Treated tapholes, however, did have a longer sap-yielding life than untreated controls.

5. Sap spout temperature.

Since the material of which the spout is made may affect the rate of thaw of sap in the taphole, an investigation was made of this effect on sap flow. In general it was found that plastic spouts, especially when exposed to warming by sunlight as in plastic bags, will thaw more rapidly than metal spouts and, hence, will yield sap sooner in the day.

6. Growth factors.

When favorable growth conditions exist during the previous season (as measured by twig or diameter growth), the sugar concentration in the sap is correspondingly increased.

PROPAGATION OF MAPLE TREES WITH HIGH QUALITY SAP CHARACTERISTICS

by

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In the fall of 1956, the United States Forest Service established a unit at Burlington, Vermont to conduct fundamental studies in forest problems of northern hardwoods in cooperation with the University of Vermont. This unit is the Burlington Research Center of the Forest Service's Northeastern Forest Experiment Station. We are developing a program of research in those aspects of sugar maple affecting sirup production that will dovetail with the long-standing program of the Department of Botany at the University of Vermont.

Data collected from a number of maple trees over the years indicate that maple sap volume and sap sweetness are controlled in some degree by inherited characteristics. Clonal material is needed to test these hypotheses. The chief sources of clonal material are (1) grafting, (2) air-layering, and (3) rooting of cuttings. In the spring of 1957 we embarked on an intensive study of the rooting of cuttings of sugar maple. This test had a dual objective of testing the effect of medium and clone upon the rooting of maple cuttings. In all, almost 8,000 cuttings from 46 clones were stuck. The mediums tested were perlite, sawdust, and sphagnum-peat-sand. The results showed that medium and clone were significant in affecting the rootings of these cuttings. In all, about 13 percent of the cuttings rooted. Of these, 45 percent rooted in perlite, 35 percent in sawdust, and 20 percent in the sphagnum-peat-sand mixture. This study was repeated in 1958 with virtually the same results.

In 1958, we extended the rooting of cutting studies to include tests of the affect of length-of-day and hormone upon the rooting of cuttings of sugar maple. The test included a dip of the cuttings into a Hormidin #3 compound and a 16-hour day. While the average rooting for all combinations of variables was about 50 percent, the data show that the 16-hour day was more

effective than the hormone dip in increasing the percentage of cuttings that rooted.

A problem that we still have to face is that of over-wintering the cuttings. The first year, we placed the cuttings in a rooting cellar, and none broke dormancy the following spring. In 1958, we placed the cuttings in refrigerators at four different temperatures, 20° F., 30° F., 33° F. and 38° F. The best results were obtained at 30° and 33°, where a little more than 1 percent of the cuttings broke dormancy the following spring. We outplanted about 160 cuttings and 60 are still alive. So, we still have a long way to go before we can produce sufficient clonal material.

At our Hopkins Experimental Forest at Willimstown, Massachusetts we have been experimenting with air-layering of sugar maple for several years. Of all the variables tested to date, it appears that the severity of wounding may be the most significant. Previous tests of complete girdles in widths of 1/4 inch, 1/2 inch, and 1 inch have shown that the 1 inch girdles were markedly superior in producing good quality air-layered material. In 1959 we tested these 1 inch-wide girdles on ten trees; there were 200-air-layerings in all. The average success of this air-layering was 67 percent. Here, too, there was strong evidence of clonal variation.

In addition to these tests, we plan to test the effect of root stock upon the sweetness of sap when scions of trees of varying sweetness are grafted upon them. A grafting program would be the easiest way to provide sufficient clonal material. But there is evidence to show that the sweetness of the sap is affected by the root stock. This remains to be tested on a scale large enough to be dependable.

In addition to these tests of various means of vegetative propagation, we have started a one-parent progeny test of sugar maple. This includes some 30 clones, 24 from Vermont and 6 from Massachusetts. In these tests, mother trees of known sweetness are open-pollinated. We wish to know to what degree, if any, the sweetness of the mother trees may be carried to the offspring under conditions of open-pollination. The hope is that upwards of 40 percent of the offspring may have the same sweetness as the mother trees. Seeds for this test were planted in the fall of 1956, and we expect to transplant the seedlings in the spring of 1960. Replicates of this test will be located at the Proctor Maple Research Farm at Underhill, Vermont and at the Hopkins Memorial Experimental Forest at Williamstown, Massachusetts. Of course, considerable time will elapse before the results are in.

Other studies at our Research Center include the effect of environment upon the growth of sugar maple and other northern hardwood trees. It is hoped that some day we will be able to delineate the effects of enviroment and heredity upon various characteristics of the trees in which we are interested.

CHEMISTRY OF COLOR AND FLAVOR OF MAPLE PRODUCTS

A Progress Report

by

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The broad objectives of our Maple Investigations might be stated briefly as follows: (1) to improve the quality of maple products, (2) to improve processing methods, and (3) to develop new and improved products to provide expanded markets for maple sirup.

Before we can hope to reach these objectives fully, it is necessary that we build a solid foundation of fundamental information about the composition of sap and maple products as well as the chemical transformations involved in converting sap to sirup. Fortunately our Maple Investigations group preserves a wealth of experience and background in this field.

To improve maple products and processing methods it is essential that we know a great deal more about the two most important components of maple sirup, its distinctive flavor and its color. Since the premium value of maple lies in its flavor, we attemped to attack this problem first. Our approach has consisted in separating both the sap and sirup into their three principal fractions - acidic, basic and neutral, by means of ion exchange procedures. It was hoped that we would find the flavor principle in one, or at most two of these fractions. Such was not the case. However, these fractions did provide us with relatively pure separations which we were able to further subdivide and analyze. This work is well known to you since the results are reproduced in the Handbook.

The analysis of the neutral or sugar fraction proved to be of great significance for this provided the basis for much of our subsequent investigations. The sugar analysis showed that the sap contains no hexose sugars and that sucrose accounted for 99.95% of the sugars, with raffinose, a glycosyl sucrose, and three unidentified oligosaccharides making up the remaining .05%.

Another and equally important phase of this earlier work was that of the determination of the nitrogenous constituents of sap. It was shown that sap contains only a trace, 0.008%, of nitrogenous material, and more important it does not contain any free amino acids. This was confirmed later by work at Cornell and Vermont by Pollard and Sproston.

We were confronted with the fact that maple sap has no flavor or color, which we had demonstrated by freeze-drying the sap, and yet it must contain some substance that contributes to the formation of these.

In 1952 Berly and Faezel, in their study of the cause of coloration of scorched cotton, presented a clue as to the probable source of colorants, as well as at least one of the reactants which form the flavor of maple. This was the formation of triose carbonyl compounds from the alkaline

degradation of hexose sugars. From our previous work we knew that we had in sap all of the conditions necessary to yield these triose compounds. Hexoses were present in sap due to fermentation, and the alkaline degradation products are formed during the evaporation of the sap. Steam distillation of sap and of sirup confirmed the presence of three-carbon carbonyl compounds - glyceraldehyde, reductone, methylglyoxal and acetol, with the acetol being in greatest amount.

In the past we had also accumulated sufficient circumstantial evidence to show that hexose (invert) sugars were primary intermediates in the formation of the brown color. Now we had rather positive correlation between color and flavor both being dependent on the triose carbonyls for their formation. These carbonyls are extremely reactive and could conceivably enter into the reaction to form the flavor as well as the coloring substances.

Since there are no free amino acids in maple sap and only an insignificant amount of nitrogenous material, there is but slight chance that color in maple is due to the interaction of an amino acid with a hexose sugar (Maillard reaction). Nevertheless we felt obligated to explore this. This work showed that in dilute solutions browning occurs principally through an interaction of the amino acid lysine with the hexose sugar. Since in maple sirup there is essentially no lysine, either as the free acid or as a peptide, it was concluded that browning occurred only from the alkaline breakdown products of the hexoses.

Therefore if we prevent the occurrence of hexose formation or keep it at a low level, only very light colored sirup could be produced. Since the invert sugars occur in sap only as a result of fermentation, the amount of color produced can be controlled by controlling the extent of fermentation of the sap. This led to a strong program of sanitation in the handling of maple sap. I am happy to report that today better than 75% of American made maple sirups are now in the two top maple grades. This was not the case 10 years ago.

We still did not know the exact identity of reactants nor the conditions for their interaction to form the color of maple. Professor V. U. Neff, in his classic work of 50 years ago, showed that some 120 compounds result from the alkaline degradation of maple. In an attempt to determine which of these are implicated in the browning of maple, we used model systems of glucose, acetol, dihydroxy acetone, reductone and glyceraldehyde which had been suggested by later workers as being those related to color formation. Using these we were able to determine the effect of pH and temperature on color formation. These studies have shown that the primary decomposition products of reducing hexoses, glyceraldehyde and dihydroxyacetone, brown in acid solutions at pH 4 to 6.5 due to the formation of glyceraldehyde and in alkaline solutions of pH 7.5 to 9 due to the formation of acetol. In a solution with a pH close to neutrality little or no color is formed.

We are now engaged in the extraction of pure colorants from maple sirup, that is, colorants that are free of all of the other constituents. This isolation of the colorants was accomplished only in the past few weeks and we have shown that they are present in sirup in only a few parts per million.

the flavoring fraction which we have succeeded in separating free from all other constituents of maple is also present in sirup in only trace amounts. The separation of the pure flavoring principle from maple sirup was perhaps our most difficult problem. This was due to two causes: (1) it, like the colorants, exists in very small amounts (perhaps only a few parts per billion) and (2) it is chemically similar to the sugars and so is separated from them with difficulty. The flavoring material was isolated by extraction with chloroform and subsequent purification of the crude extract. A small crystal, which would rest on the head of a pin, was obtained from 40 gallons of sirup and I suppose it is worth about $10,000 based on the cost of the sirup and the labor involved in obtaining it. This flavor fraction was then separated into its component parts by silicic acid chromatography.

We have accumulated a great deal of evidence which proved conclusively that the triose alkaline degradation products of the hexose sugars are an important reactant in maple flavor production. Thus these reactive compounds derived from the fermentation products of sucrose in the sap are important in both the color and flavor of maple. In the case of color formation they can interact with themselves (polymerize) to produce the color bodies. This is not the case with the flavoring agent since maple flavor cannot be produced from the sucrose of maple sap or from any of its breakdown products. By deduction, we must assume that to produce maple flavor we must have in sap something that is peculiar to it which we will call X- component, and it is this substance that interacts with the triose sugar acetol to yield maple flavor.

Within the past few weeks we have reason to suspect that this substance X is derived from soluble lignins or lignin-like materials present in the sap. This has in no way simplified our flavor problem for unfortunately knowledge of the chemistry of the lignins is very inadequate. But let us see why we believe lignin to be implicated in maple flavor.

In separating the flavor fraction by fractionating it on silicic acid we have isolated several chemical compounds. One of these, vanillin, is a substituted phenol i.e. the aldehyde of guaiacol. Vanillin was first obtained from coniferin, a glucoside, found in the sap of conifers. Another fraction was also found to be a phenolic derivative i.e. syringaldehyde, which is the dimethyl ether of the aldehyde of pyrogallol found in many plants. Both of these compounds were in the smaller fractions and neither had the odor of maple.

The third fraction was not only the largest of those separated, but it was also the most important because it had most of the maple characteristics. We do not know its chemical nature completely, but we do have a lot of information concerning it.

It is fluorescent (gives off light when exposed to ultraviolet light); it has a very high melting point, (this might be an explanation of why maple flavor has such a low vapor pressure), and the infrared absorption curves (fingerprints) show it to be a closed chain with an unsaturated structure, and that it does not contain OH groups.

The IR (infrared) fingerprint of this maple flavor fraction meets in many respects the requirements of the α-ethoxypropiosyringone (the lignin derivative obtained from maple trees) except that our compound has no OH groups.

We would like to speculate that our lignin-like material contains instead substituted groups derived from the triose sugars.

I regret that due to lack of time I have not been able to tell you about the important bacteriological work that is being conducted by Dr. Frank. I also want to acknowledge the work of Dr. Underwood on the separation of the colorants and flavor-free fractions of maple sirup, and that of Dr. Lento on the model systems of colorant formation and the work leading to the implication of lignin-like material in maple flavor.

USE OF PURE MAPLE BY THE ICE CREAM INDUSTRY

by
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My interest in maple products goes back a number of years when several of us at the Cornell Dairy Department decided to see if making maple sirup in dairy plant equipment would be a practical operation. A vacuum evaporator, such as is used in making various concentrated dairy products, was the piece of equipment we were most interested in trying. For several consecutive years we collected sap and concentrated it in the vacuum pan. Since the pan temperature was about 140° F., the concentrated sirups were sweet, but extremely mild in maple flavor. Finishing the concentrating process in an open steam-jacketed kettle produced the desired flavor and top-quality sirups resulted. These findings were not new, but we did demonstrate that dairy plant equipment could be used to make good maple sirup. Dr. Willits knew of our interest in this area and our natural interest in dairy products. When work at his laboratory resulted in products that might have potential use as flavoring for ice cream, we were given the opportunity of working with them under a research contract from the U.S.D.A.

The project was set up to study the potential uses of high-flavored maple products as flavorings, toppings, revels, or confections in ice cream. The study also included some work with U.S. Grade B and U. S. Unclassified farmers' run sirups. The high-flavored sirups were made from grades AA, A, B, and Unclassified sirups according to the process described in the U.S.D.A. patent on this subject. Dr. Underwood supervised the high-flavoring treatments at the plant from which the sirups were purchased.

The different forms of ice cream made were judged first by a laboratory panel consisting of ten experienced food judges. This panel was often used to screen out unsatisfactory products from those to be submitted to the consumer

panel. This latter panel consisted of volunteers from the Cornell Campus--students, faculty, or visitors were asked to judge samples at a tasting booth set up at various locations on the Campus. Approximately 100 persons were involved in each consumer panel test of a product. Consumers were asked to indicate a preference when a pair of samples was judged and also to rate the products sampled on a 9-point hedonic scale. Information regarding age, background, use of maple products, etc., was also obtained from each consumer. These various data were tabulated on IBM cards and analyzed statistically later on.

Some of the results of the study were:

I. Farmers' Run sirup as ice cream flavoring

A modified mix was prepared to enable the inclusion up to 25 per cent maple sirup in the ice cream. At this level all of the sugar in the mix (16.75 per cent) came from the maple sirup. The other samples tested had 20 and 15 per cent maple sirup with additional cane sugar so that all mixes contained the same basic 16.75 per cent sugar.

A. Unclassified grade: the preference ran toward the 15-20 per cent concentration samples. About 20 per cent of the judges described the flavor as maple, the rest called it butterscotch, toffee, coffee, caramel, etc.

B. Grade B: Preference was most frequently for the 25 per cent concentration with about one quarter of the samplers recognizing the flavor as maple.

This part of the study confirmed the fact that high concentrations of ordinary maple sirup are needed to flavor ice cream.

II. Farmers' Run sirups as revels

A revel is a heavy sirup that is added to ice cream as it comes from the freezer. It appears in the finished product as streaks or ribbons. Maple sirup itself is not suitable for reveling; it must be thickened to prevent its draining from the ice cream and to prevent the formation of ice and sugar crystals. Sodium carboxymethyl cellulose at the rate of 15 grams per quart of sirup was found to produce the desired degree of viscosity. With both grade B and Unclassified sirup revels, the preference was for about 20 per cent revel material in the ice cream. This is somewhat higher than is used for other revel flavors. The laboratory panel commented on a caramelized sugar flavor in the Unclassified grade revel. This was not noted by the consumer panel.

III. Farmers' Run sirups as toppings

The sirups were further concentrated by open kettle boiling and

were then treated with Convertit, an enzyme preparation which catalyzes the hydrolysis of sucrose to the monosaccharides in which form crystallization will not take place. Crystallization would be almost certain at the 72 to 78° Brix concentrations used had the enzyme treatment not been carried out. The toppings were placed on samples of vanilla ice cream ofr judging by the consumers. The 72° Brix topping was preferred in Grade B and 75° Brix in the unclassified grade. About two-thirds of the consumers correctly identified the flavor of the toppings as maple.

IV. Testing high-flavored sirups as ice cream flavorings

The laboratory panel selected 18 per cent Grade A high-flavored sirup. They also indicated that a comparable flavor could be obtained by using a somewhat lower concentration of Grade B high-flavored sirup. Ice creams were made with 13, 16, and 19 per cent concentrations of B and submitted to the consumer panel. The sample with 19 per cent was selected by this panel, and about 35 per cent of the consumers recognized the flavor as maple. This was some improvement over the concentration of Farmers' Run sirup needed to give good flavor, but not enough to make the product appealing to the ice cream manufacturer. Still higher flavor intensity is required. Dr. Willits and co-workers are developing methods of making concentrates in this range. We tried one, on a limited scale only, that flavored ice cream when added at the level of just a few per cent. This product would, I believe, have favorable acceptance by the ice cream industry.

V. High-flavored sirups as revels

The sirups were again thickened by the addition of carboxymethyl cellulose. Revels from Grade A high-flavored sirup were selected by the laboratory panel for submission to the consumers. The levels submitted were 10, 15, and 20 per cent revel in the finished ice cream. The concentration most preferred was 20 per cent, with about 60 per cent of the consumers recognizing the flavor as maple.

The number recognizing the flavor increased somewhat in the next set of tests in which the maple revel was placed in a "background" ice cream already containing some maple flavor. The combination of 10 per cent maple in the background and 15 per cent in the revel was preferred and recognized as maple by about 66 per cent of the people tasting these products.

VI. Toppings from high-flavored sirups

The laboratory panel selected the toppings made from a mixture of equal parts of Fancy A and B high-flavored sirups. These toppings at 72, 75, and 78° Brix were placed on vanilla ice cream samples and judged by the consumers. The topping at 72° Brix was preferred most frequently and about two-thirds of the consumers recognized the flavor as maple.

VII. Maple confections in ice cream

The various high-flavored maple sirups were made into confections and added to ice cream with a mild vanilla or a mild maple background flavor. The candies were prepared by cooking the sirups to 250° F. in an open kettle, stirring while crystallization took place, and then forcing the nearly dry sugar through a screen with holes of about one-quarter inch diameter. With the high-flavored sirups made from the lower grades of sirup it was necessary to seed with finely powdered sucrose to induce crystallization. This was attributed to the relatively high invert sugar content in these sirups. The laboratory panel selected the product made from U. S. Grade B high-flavored sirup for submission to the consumer panel. This was done, using the candies at the rate of one-half, three-quarters, or one pound per gallon of ice cream mix. These concentrations are about comparable to those used for other flavorings. The consumers preferred the samples of ice cream containing three-quarter pound of confection per gallon of mix. The flavor was recognized as maple by about 78 per cent of the consumers. It should be noted that this was the highest recognition achieved.

To summarize the results of the study:

1. Commercial maple sirups can be used to flavor ice cream, although the concentration necessary is above the ordinarily used for other ice cream flavors and the product borders on being too sweet when enough sirup is added to give good flavor. The flavor is often mistaken for one of the caramelized-sugar flavors. High-flavored sirups can be used in slightly lower concentrations, but not enough lower to make their use promising. Ultra-high-flavor concentrates do offer more promise.

2. Lower concentrations of maple can be used when the maple is presented in such a way that the consumer gets bits of it in more concentrated form than when it is used as a simple flavoring material. Some of these desirable forms are revels or toppings. The recognition of the flavor as maple is much higher when the maple is presented in these forms.

3. The most successful products were those making use of maple in the form of a confection in the ice cream. The recognition was highest in this case, and amounts needed were comparable to the requirements for other candies used in ice cream. More work could well be done on finding the best way of making candies for use in ice cream.

IMPROVING QUALITY AND QUANTITY OF MAPLE SAP

by
Putnam W. Robbins, Michigan State University
East Lansing, Michigan

Almost fifty years ago Edson, Jones and Carpenter presented their nonumental work on the microorganisms of maple sap. The next twenty years found little or no research on the effect of bacteria, mold or yeast on the quality or quantity of maple sap produced from maple trees. This was an era when the mechanics of handling the sugar bush received some investigations generally by extension foresters, who were not trained or prepared to make detailed investigations on the relationship of quality of sap to microorganisms in the maple tree taphole.

In 1933, A. C. McIntyre reported on the "Effect of Crown Size on Sap Flow" and concluded that the size and vigor of the maple trees are the dominant factors influencing sap flow.

Josh Cope, in 1949, reported that Zura Smith of Leon, New York secured larger quantities of sap by tapping to a depth of four inches rather than the usual 2 to 2-1/2 inches. Cope and many others in their bulletins covering the management of the sugar bush attributed the reduction and stoppage of flow from maple tree tapholes as due to the drying-out of the taphole.

Robbins, in 1948, reported that the quantity of maple sap from over 350 tapholes during a three year period was not affected materially by the position occupied by the taphole. Trees tapped on the east, south, and west produced approximately the same volume of sap, while trees tapped on the north quadrant yielded a few pounds less. He found that the average flow per year for the three year period was 9 gallons per taphole.

Moore, Anderson and Baker, in 1951, substantiated Robbins' findings that little difference in total seasonal volume of sap occurred for buckets hung on the north, east, south or west quadrant of the tree. They also agreed with McIntyre that the open grown trees were superior in volume and sweetness of sap over densely grown trees.

In 1953 the forestry Department of Michigan State University in cooperation with the Eastern Utilization Research and Development Division of the Agricultural Research Service, United States Department of Agriculture, investigated some of the factors which might have an influence on the quality and quantity of maple sap production from farm woodlands. The investigations covered four seasons and recorded the daily and total maple sap yields from 168 tapholes. The records showed considerable variation in the yield of maple sap, which were not all accounted for by testing the many factors of depth of tapping, type of spile, diameter of spile, and position of tapping. Therefore, when Sproston and Lane reported on maple sap contamination and Naghski and Willits reported on "Microorganisms as a Cause of Premature Stoppage of Sap Flow from Maple Tapholes," it was logical to conduct a more detailed investigation into the role of microorganisms in relation to the quality and quantity of maple sap flow.

In this microorganism project, 50 trees were tapped with 2 holes per tree; one an "aseptic" taphole after the technique developed by Drs. Porter and Willits at the Eastern Laboratory, and one taphole was made in the normal manner employed by sirup producers.

All maple sap was collected each day of flow, and in addition samples of sap were collected in sterilized bottles on January 10 and 25, February 10 and 25, and March 10, to test for the presence of microorganisms. Drs. Jack Sheneman and Ralph Costilow have reported on the 1,273 cultures in their article "Identification of Microorganisms from Maple Tree Tapholes," published in Food Research, 1958. They found four major groups of bacteria in the 469 cultures isolated, also nine species representing five genera of yeasts among the 412 cultures of yeast examined and a smaller number (379) of molds. Both bacteria and yeast populations were shown to develop to high levels in the tapholes containing regular spiles. In the companion study of the quality and yield of maple sap produced, Sheneman, Costilow, Robbins and Douglas found that "aseptic" tapping was successful in delaying the development of high populations of microorganisms in tapholes bored early in the season. This yield of maple sap from "aseptic" tapholes made early in the season was significantly higher than that of regular tapholes made at the same time. Stating it another way, the "aseptic" tapholes produced from 46 to 75 per cent more maple sap than taps made in the normal way. Therefore, it was concluded that microorganisms reduce the total flow from tapholes which become infected by bacteria, yeasts and molds.

In order to show that the quality of maple sap may be improved by control of the microorganisms, samples of the maple sap from the project trees were converted to sirup each day during the 1956 season. The maple sirup produced was in the light amber color grade right up to within three days of the end of the season on April 15th.

In 1956 the trees were again tapped, only this time the trees capable of carrying three buckets (trees in the 20-inch diameter class at breast height) were tapped with three holes. One hole with a regular spile, one in an "aseptic" manner, and the third tapped "aseptically" but in addition at tapping time this hole received 2 ml. of a solution containing bacteria mold and yeast isolated from the tapholes the previous year. Thus, one of the three holes was contaminated with microorganisms from the very first day of tapping.

I have shown that quality and quantity of maple sap is affected by microorganisms. Therefore, how may we prevent this contamination in a practical manner adaptable to sugar bush operations and secure the maximum volume of high quality maple sirup? The system of "aseptic" tapping, which has shown that microorganisms are the cause of reduced flow and stoppage of maple sap flow, is not a practical method for the sugar bush operator. Therefore, chemicals were tested as a method of control for the microorganisms. Sheneman, Costilow, Robbins and Douglas in 1956 tried aureomycin and hypochlorite solution as rinses and also sorbic acid pellets inserted in the taphole. The sorbic acid provided some control of bacteria and yeasts, but made the sirup taste terrible. The other treatments were not staisfactory.

James Marvin and Mary Greene in 1959 reported on the use of valve and tube spouts and sorbic acid, ethyl alcohol and chlorox, and found the treatments gave a statistically significant increased yield over the control.

When the 1957 sirup season arrived additional chemicals were tested including (1) trioxymethylene in agar pellets, (2) trioxymethylene in plaster of paris pellets, (3) mercuric iodide in pellet form, (4) "Sterlite" powder, (5) "O-Silver" solution and (6) mechanical methods using "Tygon" plastic tubing. The trioxymethylene pellets and the "Sterlite" powder gave significantly greater yields of maple sap over the non-treated tapholes, and provided practical control of the microorganisms. The mercuric iodide also gave positive control of the microorganisms. However, due to the danger of some person being poisoned by this chemical, all sap from tapholes treated with mercuric iodide was allowed to drip on the ground, and for that reason no yield data is available. The average yield for the treated tapholes was 334.6 pounds or approximately 40 gallons of sap, while the untreated tapholes produced an average of only 84.5 pounds or approximately 10 gallons. This yield of 40 gallons of maple sap per taphole is remarkable, for the average yield from a 1,000 bucket sugarbush as reported by Robbins over a three year period was 9 gallons per taphole. In 1955 Morrow reported the yield of maple sap per bucket or taphole from 70 buckets from woods trees to be 13 gallons, and from 92 semi-open grown trees, a yield of 16 gallons, and from 48 roadside trees, 24 gallons. Therefore, this yield of 40 gallons of sap from the tapholes of woods trees when the microorganisms are controlled is remarkable and offers great possibilities to the sugarbush operator for increasing the yield of sap from his woods by controlling the microorganisms in the tapholes.

In 1959, to further test the practicability of trioxymethylene pellets in the production of high quality maple sap and increased yields of sirup, the Forestry Department of Michigan State University entered into a new contract with the Eastern Utilization Research and Development Division of the Agricultural Research Service of the United States Department of Agriculture. The new project in 1959 tested the control of microorganisms in the maple tree tapholes with different concentrations of trioxymethylene, endeavoring to find one which would control the bacteria, yeast and molds and at the same time leave a minimum amount of chemical in the finished maple sirup. In this project fifty trees were selected at random from two and three-bucket trees which had averaged 13 gallons or more of sap per taphole during the past four seasons. The treatments per tree were also randomized with each tree being tapped with one control, one tap with a small pellet, and the third with a double size pellet.

The maple sap season during 1959 was very abnormal in Michigan, as no sap flows occurred in February. In Michigan, February has often produced one-third or more of the total season's crop.

The weather remained cold during February and the first part of March with the first flow of sap starting March 10th, which was again followed by eight days of cold weather. Therefore, this was a poor season to test the development of microorganisms in maple tree tapholes, as there were no periods of

warm days to encourage the development of bacteria, yeast and molds during the early part of the season. However, even with a season unfavorable to the production of microorganisms the light and heavy treatments of trioxymethylene gave increased yields of sap. The data when analyzed statistically showed that the use of trioxymethylene pellets in the tapholes of maple trees tapped for the production of maple sirup again as in 1957 produced yields of sap significantly higher than that from untreated tapholes. Twenty-seven of the fifty normal tapholes stopped flowing seven days before the last collection of maple sap. However, only four of the 100 treated tapholes stopped flowing seven days before the last collection of sap. The total volume of sap collected on the last day was 99.6 pounds for the untreated, while the holes treated lightly with trioxymethylene pellets producted 274 pounds and the more heavily treated holes, 426 pounds of maple sap.

Now you are probably asking, "What about the Quality?"

The treatments not only increased the quantity but produced high quality maple sap. Samples of maple sap collected periodically during the season and tested for total counts of microorganisms showed that both levels of trioxymethylene treatments gave good control of the bacteria and yeast throughout the season. The quality of the finished sirup was determined by concentrating the sap from the control and the two treatments separately, in a regular fire-arch evaporator, right in the experimental woods area.

The maple sap was concentrated to sirup on those days when fifty gallons or more of sap were collected from each of the three treatments. Samples of the finished maple sirup were then tested for quality, by taste, and specific gravity and color using the "Glass Color Standards for Maple Sirup" as developed by Brice and Turner. The samples were then tested for the presence of formaldehyde in the laboratory by Dr. Costilow of our Department of Microbiology and Public Health. Duplicate samples were also tested in the Chemistry Department under the supervision of Dr. John Speck. We can say at this time that the amount of formaldehyde left in the sirup is very small, and that we hope to have the pellets available for trial by producers during the 1961 season. However, they will not be released until we have demonstrated that all formaldehyde is removed and the use of pellets are approved by the Food and Drug Administration.

The data I have presented demonstrates conclusively that it is possible to improve the QUALITY and the QUANTITY of maple sirup production from maple trees by controlling the microorganisms in the tree tapholes through use of trioxymethylene. Now how else may we increase the production of maple sirup from the farm woodland?

To attack this problem on another front, Professors Donald P. White and Putnam W. Robbins, of the Forestry Department at Michigan State University, decided to test the effect of chemical fertilization on the yield of maple sap and sugar. The fact that the Forestry Department had the accurate record of the daily maple sap yields for a period of four seasons from 124 trees all recorded on International Business Machine punched cards made it

possible to compare past yields with yields after treatment with fertilizers. A broadcast application of nitrogen, phosphorus and potash materials were made separately and in combination around randomly selected maple trees in the experimental sugarbush. Commercial type fertilizers were applied at the rate of 100 pounds per acre of nitrogen, 90 pounds per acre of P_2O_5, and 120 pounds per acre of K_2O early in May, 1957 to 1/20th acre plots with individual test trees at plot centers. Each treatment was represented by six trees for which pretreatment sap yields were available.

Trees were tapped by standard procedure during the 1958 season. A special trioxymethylene pellet was placed in the taphole to control bacterial contamination and thus prevent the influence of microorganisms affecting yields. Daily observations of sap yields per hole by weight and sugar content were made during the 1958 season, which started late in February and continued to the first week in April.

The data of White and Robbins from their study of the first season's yields after treatment indicate that nitrogen-phosphorus fertilizer application significantly increased maple sap yield per tree, with no reduction in average sugar content of the sap. The trioxymethylene pellets were highly effective in prolonging uniform maple sap flow.

Maple sirup producers for a long time have recognized that the early maple sap runs produced the better quality maple sirup and sugar, and that all equipment should be thoroughly cleaned and sterilized before the sap season started in order to produce high quality sirup. However, most producers did not realize that microorganisms are largely responsible for lower quality sirup being made after the early sap runs. We have shown that microorganisms may be controlled in the taphole, and that higher quality maple sirup can be made when bacteria, yeast and molds are controlled, and also that the yield of sap and maple sirup may be increased significantly by the use of trioxymethylene pellets in the tree taphole, and application of nitrogen-phosphorus commercial fertilizer. I would like to conclude by recommending that maple sirup producers pay close attention to the following:

(1) Start every sirup season with all equipment from spiles to storage tanks clean and sterilized.

(2) Use the new trioxymethylene pellets in the tree tapholes in their sugarbush management program for greater quality and better quantity of maple sap and sirup production.

(3) Consider the application of nitrogen-phosphorus commercial fertilizer to the maple trees being tapped for greater sap yields.

APPENDIX

Minutes of the AD HOC Committee and subsequent meeting of the National Maple Sirup Council

held at the
Eastern Utilization Research and Development Division
Philadelphia, Pa.

AD HOC COMMITTEE MEETING, October 27, 1959.

Milton Thibaudeau, Luxemburg, Wisconsin, became Chairman pro tem by common consent of the group. He raised the question of how to begin a national council of the sirup industry. Ralph Spade, Ferrisburg, Vermont suggested that the organization consist of a federation of existing state councils or one representative from each state producing maple sirup. James W. Marvin, University of Vermont, reported that in 1956 the Vermont Maple Industry Council was set up to get all segments of the Vermont maple industry together, including producers, blenders, equipment dealers and manufacturers, and representatives of State departments of marketing, agriculture, etc. Robert Moroney, Ogdensburg, New York, proposed that only one representative be selected from each maple producing state whether a producers' organization exists there or not. C. O. Willits, Eastern Utilization Research and Development Division, agreed since some states have several organizations and others have none. His suggestion was to use officers of existing organizations as representatives to initiate a council. F. E. Winch, Jr., Cornell University, raised the question, "Are we in favor of a national council?" No motion followed but assent was inferred from continued positive discussion. P. W. Robbins, Michigan State University, suggested that the group consider the forming of local chapters of a national council. Dan Anderson, Holcombe, Wisconsin, raised the question of whether there could be a combination of states - that is, Wisconsin and Iowa to have one representative to a national council. Lyle Silker of Onamia, Minnesota, a maple producer, stated that there are no local producers' associations in Minnesota. It was agreed that in such case Mr. Silker would represent the state of Minnesota to the National Constitutional Committee of the council and would present the constitution and bylaws as proposed by the council to interested persons in his state. P. W. Robbins moved that the presidents of existing organizations serve, or appoint someone to serve, on the committee to draw up a constitution and bylaws for a National Maple Sirup Council to present to local groups for approval. Motion was seconded by Ralph Spade and passed by the group.

It was suggested that location reaction be tested by presenting proposed constitution and by laws for a national council to interested persons in each state. Where there is an organization, the question should be presented to that organization for its approval or disapproval. Where no organization is present, maple producers and other interested persons should be apprised of the plans for a national council. If sufficient interest is shown, a local organization could be set up to make their wishes

known to the interim council committee. T. A. Peterson of the University of Wisconsin questioned whether the national organization would be a council of representative groups or a board of officers. All questions were postponed until a proposed constitution and bylaws would be written. The following are representatives to the committee for writing a proposed constitution and bylaws:

Ture Johnson	Burton, Ohio
George Keim	West Salisbury, Pa.
Lloyd Sipple	Bainbridge, New York
Milton Thibaudeau	Luxemburg, Wisconsin
*P. W. Robbins	Mich. State U., East Lansing
Clyde Bryant	Manchester Center, Vermont
Lyle Silker	Onamia, Minnesota
Burton Benton	Thorton, New Hampshire
Linwood Lesure	Ashfield, Massachusetts

*For three maple associations in Michigan

The officers representing the three organizations in Michigan shall decide among themselves who shall represent Michigan on the council. In relation to maple producing states not here represented, Mr. W. W. Simonds proposed that we obtain a list of the Extension Foresters of each state producing maple sirup and forward a copy of these minutes to each, requesting that he disseminate to interested persons. P. W. Robbins moved that a copy of the constitution and bylaws of the proposed national council be sent to each Extension Forester of a maple producing state with the request to disseminate the information to interested persons. The motion was seconded by F. E. Winch and passed by those present.

These minutes shall be made available to all persons present by being included in the report of the maple conference with the consent of Dr. P. A. Wells, Director, Eastern Utilization Research and Development Division.

Mrs. John B. Zimmerman
Stonebridge Farm
Stoystown, Pennsylvania

At the Wednesday, October 28, session of the conference Milton Thibaudeau gave a brief summary of the AD HOC committee meeting held the preceding day. He advised that a National Maple Sirup Council had been organized and the policy and aims of this council would be presented only after a set of bylaws governing them had been approved by the council members. He requested that those members of the council who were present meet following the close of the conference.

THE NATIONAL MAPLE SIRUP COUNCIL MEETING, October 28, 1959.

This initial meeting of the Council was called by Milton Thibaudeau. Those present were:

Milton Thibaudeau	Wisconsin
Ture Johnson	Ohio
George Keim	Pennsylvania
Lloyd Sipple	New York
*P. W. Robbins	Michigan
Lyle Silker	Minnesota
Clyde Bryant	Vermont

Mrs. John Zimmerman, Acting Secretary

*Represented three Michigan associations

Mr. Thibaudeau was elected Acting Chairman and Mrs. John Zimmerman, Acting Secretary, both to serve until these offices are filled formally by election from the entire Council.

It was agreed to have the minutes of the AD HOC committee meeting typed and distributed to Extension Foresters in each of the maple producting states, who would duplicate these minutes and be responsible for their distribution to their respective maple producers. The maple sirup producing states will be selected from USDA crop reporting lists.

It was also agreed that the presidents or secretaries of all local and state maple sirup organizations would be contacted by Mrs. Zimmerman as Acting Secretary of the Council and copies of their respective bylaws obtained. These would be compiled and circularized among the Council members. From these the National Maple Sirup Council will develop their bylaws which will later be submitted to member organizations for approval.

C. O. Willits
Eastern Utilization Research
and Development Division

LIST OF ATTENDANCE

Name	Organization	Address
Anderson, D.		Holcombe, Wisc.
Anderson, D. (Mrs.)		Holcombe, Wis.
Baker, R.	Minnesota Mining & Mfg. Co.	Freehold, N. J.
Baltus, J.	Wisconsin Dept. of Conservation	Wausau, Wisc.
Barnes, C. P.	Agri. Research Service, USDA	Washington, D.C.
Barraclough, K. E.	University of New Hampshire	Durham, N. H.
Baxter, F. A.	General Foods Corp.	White Plains, N.Y.
Beabes, N. E.	Maple Producer	Hooversville, Pa.
Beebe, G. R.	Columbian Rope Co.	Auburn, N. Y.
Bell, R. A., Jr.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Bender, R.	Essex County Agent	Westport, N. Y.
Bochy, J. A.	Somerset County Agric. Extens. Association	Somerset, Pa.
Bryant, C.	Vermont Maple Sugar Makers' Assoc.	Manchester, Vt.
Buist, J. A.	Minnesota Mining of Canada	London, Ontario Canada
Burton, D. L.	Agri. Marketing Service, USDA	Washington, D.C.
Coombs, R.G., Jr.	Coombs Maple Products	Jacksonville, Vt.
Coombs, R.G., Jr. (Mrs.)	Coombs Maple Products	Jacksonville, Vt.
Curtis, R.K., Jr.		Newfoundland, Pa.
Davis, D. R.	Ohio Agri. Expt Station	Wooster, Ohio
Delisle, R.	Quebec Forestry Extension Bureau	Quebec City, Canada
Donelson, L.	Farm Journal, Inc.	Philadelphia, Pa.
Dryden, E. C.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Farrand, E. P.	Pennsylvania State University	Univ. Park, Pa.
Farrell, K. T.	Corn Products Co.	New York, N. Y.
Ford, W.	Whitford Woods	Middlefield, Ohio
Frank, H. A.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Gilbert, A.	Forest Service, USDA	Burlington, Vt.
Hacskaylo, J.	Ohio Agri. Expt. Sta.	Wooster, Ohio
Hall, H. D.	Maple Producer	Somerset, Pa.
Hall, H. D. (Mrs.)	Maple Producer	Somerset, Pa.
Hanrahan, R.		Kewaunee, Wisc.
Hanrahan, R. (Mrs.)		Kewaunee, Wisc.
Hayes, K. M.	University of Massachusetts	Amherst, Mass.
Holbert, M. H.		Genesee, Pa.
Huxtable, R. B.	Sugarbush Supplies Co	Lansing, Mich.
Jean, M.	Laval University	Quebac, Canada
Johnson, F. R.	Johnson Salisbury Co.	New York, N. Y.
Johnson, R. M.	Geo. H. Soule Co., Inc.	St. Albans, Vt.
Johnson, T. L.	Ohio Dept. of Natural Resources	Burton, Ohio
Jones, A. R. C.	MacDonald College	Quebec, Canada
Jordon, W. K.	Cornell University	Ithaca, N. Y.

Name	Organization	Address
Keim, G.		W. Salisbury, Pa.
Keim, G. (Mrs.)		W. Salisbury, Pa.
Knight, J.	American Felt Co.	Philadelphia, Pa.
Korth, J. A.	Corn Products Co.	Argo, Illinois
Lamb, R. M.	A. C. Lamb and Sons	Liverpool, N. Y.
Lamb, R. M. (Mrs.)	A. C. Lamb and Sons	Liverpool, N. Y.
Landry, C. E.	Les Producteurs De Sucre	Plessisville, Quebec, Canada
Larkin, L. C., Jr.	Agri. Marketing Service, USDA	Washington, D. C.
Lento, H. G.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Lighthall, H. (Mrs.)	University of Vermont	Burlington, Vt.
Lothrop, R. E.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Marvin, J. W.	University of Vermont	Burlington, Vt.
McQuilkin, W. E.	Northeastern Forest Expt. Sta.	Upper Darby, Pa.
Meschter, E. E.	American Stores Co.	Philadelphia, Pa.
Mills, E. S.	Maple Producer	Springport, Ind.
Mohr, H. K.	General Foods Corp.	Hoboken, N. J.
Monroe, R. J.	North Carolina State College	Raleigh, N. C.
Moroney, R. H.	Vermont Evaporator Co.	Ogdensburg, N. Y.
Morris, R. H.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Morrow, R. R. Jr.	Cornell Agri. Expt. Sta.	Ithaca, N. Y.
Neff, A. G.	American Felt Co.	Philadelphia, Pa.
Pasto, J. K.	Pennsylvania State University	Univ. Park, Pa.
Peterson, T. A.	University of Wisconsin	Madison, Wisc.
Plagge, I. F.	Boweys Inc.	Chicago, Ill.
Ratchford, W. P.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Reynolds, A.	Reynolds Sugar Bush	Aniwa, Wisc.
Richards, P. A.	W. S. Richards & Sons	Chardon, Ohio
Robbins, P. W.	Michigan State University	East Lansing, Mich.
Sanford, M.		Little Genesee, N. Y.
Sanford, M. (Mrs.)		Little Genesee, N. Y.
Santamour, F. S., Jr.	Forest Service, USDA	Philadelphia, Pa.
Savage, J. K.	Farmer Cooperative Serv. USDA	Washington, D. C.
Schreiner, E. J.	Northeastern Forest Expt. Sta.	Upper Darby, Pa.
Schuler, L. D.	Extension Service, USDA	Burton, Ohio
Shute, H. V.	Vermont Dept. of Agriculture	Montpelier, Vt.
Silker, L.	Maple Producer	Onamia, Minn.
Silker, L. (Mrs.)	Maple Producer	Onamia, Minn.
Sills, M. W.	Agri. Marketing Service, USDA	Philadelphia, Pa.
Simonds, W. W.	Pennsylvania State University	Univ. Park, Pa.
Sipple, L. H.	N. Y. State Maple Producers' Assoc.	Bainbridge, N. Y.
Sipple, L. H. (Mrs.)	N. Y. State Maple Producers' Assoc.	Bainbridge, N. Y.

Name	Organization	Address
Smith, X. K.	Western N. Y. Maple Producers' Assoc.	South Dayton, N.Y.
Spade, R. I.	Maple Products Sales	Ferrisburg, Vt.
Tansman, M.	Cary Maple Sugar Co., Inc.	Brooklyn, N.Y.
Tardif, J.	Quebec Dept. of Agriculture	Quebec, Canada
Thibaudeau, M.	Wisconsin Maple Producers' Council	Luxemburg, Wisc.
Thibaudeau, M. (Mrs.)	Wisconsin Maple Producers' Council	Luxemburg, Wisc.
Underwood, J. C.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Vaillancourt, J. O.	Les Producteurs De Sucre D'Erable De Quebec	Levis, Quebec, Canada
Virkler, C.		Lowville, N. Y.
Wells, P. A.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Wendt, A. S.	Fred Fear & Co.	Brooklyn, N. Y.
White, W. E.	Pennsylvania State University	Univ. Park, Pa.
Willaman, J. J.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Williams, F. T.		South Sutton, N.H.
Williams, F. T. (Mrs.)		South Sutton, N.H.
Williams, D. (Miss)		South Sutton, N.H.
Williams, W. K.	Federal Extension Service, USDA	Washington, D. C.
Willits, C. O.	Eastern Util. Res. & Dev. Div.	Philadelphia, Pa.
Wilson, G.		Keene, N. Y.
Wilson, R. W., Jr.	Northeastern Forest Expt. Sta.	Upper Darby, Pa.
Winch, F. E., Jr.	Cornell University	Ithaca, N. Y.
Winston, A. A.	General Foods Corp.	Hoboken, N. J.
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